

CORROSION

Corrosion leaks pose many questions with regard to successful patching. One general rule when patching corroded casing is to have both ends of the patch set in relatively good pipe. Therefore, when dealing with long corrosion zones (in excess of 50 or 60 ft., see Extended Length Patches Page 17) it is important to know the condition of the entire casing string.

In severe corrosion applications, where the I.D. of the casing is known to be significantly oversized throughout the corrosion zone, a specially sized or a standard patch with extra wraps of fiberglass cloth may be required. Also in severe cases the casing may be prone to splitting. If this is known or suspected refer to "Split Casing" above.

Another concern when dealing with severe corrosion applications is the position of the hold down when setting the patch. Repositioning of the hold down in the work string may be required; or if the work string is strong enough, the hold down can be left out of the system.

If corrosion of the patch is a concern, a corrosion resistant patch material can be used (see Corrosion Resistant Patches, Page 17).

WATER ENCROACHMENT OR CONING

Dramatic improvements in production have been realized in the North Sea, using the casing patch to block off the lower portion of long production zones affected by water encroachment and coning. Not only is the water to oil ratio improved, or eliminated, but the drive fluid remains in the formation, reducing injection requirements and extending the productive life of the well.

Estimating the proper position for the top of the patch in water encroachment applications can be determined by a number of methods such as flow tests, formation dynamics and water-oil ratios.

Refer to Perforations, Page 5 for further information.

REASONS BEHIND THE QUESTIONS

Some of the questions raised in the previous section may seem to be unnecessary. There is a reason for each of them and those reasons are presented in the following pages.

CASING SIZE AND WEIGHT ?

The patches and expander equipment are designed for each size and weight of casing or tubing. If the weight of the casing is not known, damage of the setting equipment may result or the patch may not be formed perfectly resulting in minor leakage.

I.D. RESTRICTIONS ABOVE, IN OR NEAR LEAK AREA ?

The patch and setting equipment have limited clearance thru the casing. Therefore, if there are restrictions such as a previous patch in the casing, a mixed weight casing string, a heavier weight casing at the surface, or landing nipples, etc. above, in or near the area to be patched, special setting equipment or setting procedures may be required. It is difficult to pass the equipment thru restrictions greater than 3/8" in diameter.

This type of situation occurs quite often but typically can be handled if known in advance. If there is a restriction in the patch area and it isn't planned for, the result could be getting stuck in the hole with the patch partially set. This is one reason for the recommended drift runs.

Clearly, when there are restrictions of any kind in the casing string it is important to know (accurately) the I.D., length and location of the restricted area. In these cases, consult with HOMCO's Casing Patch Manager in Houston.

HOLE DEVIATION ? DEPTH AND SEVERITY OF DOGLEGS ?

High deviation or doglegs may cause difficulties in running the setting equipment and patch in the hole. A drift run with drill collars or flush O.D. pipe (with an O.D. slightly larger than the unset patch) at least as long as the patch and setting equipment is strongly recommended in these cases.

If the patch or setting equipment gets hung up running in the hole, the patch may be set in the wrong position while trying to work it thru a severe deviation or dogleg.

FLUID LEVEL ?

Minor modifications to the setting procedures and special equipment may be required if the fluid level is low.

FLUID WEIGHT ?

Solids in the well fluid may settle out on top of the setting tool. These solids may plug the tool preventing operation or may interfere with the safety clutch inside the bottom of the tool. Measures should be taken to prevent solids from settling out of the well fluid during patch setting operations.

CORROSIVE FLUID ?

Corrosive fluids may damage tool components or seals. A special corrosion resistant patch may be required. (See page 17)

PRESSURE RATING REQUIRED ? INTERNAL AND EXTERNAL

It is always important to consider the immediate as well as future pressure requirements for the patch prior to setting. Refer to Page 20 for pressure ratings. If the internal or external pressure rating of the standard patch is not sufficient, a heavy wall patch should be considered. (see Page 18).

DEPTH OF LEAK(S) OR LEAKING ZONE(S) ?

The importance of accurate depth to leak measurements cannot be over emphasized.

When locating the leak(s), keep in mind that the patch must be centered to achieve a maximum overlap on each end (see Locating Leaks and Correlating Depth, Page 14). It is recommended that the patch overlap the leak by 6 to 8 feet on each end to assure a positive seal.

TYPE OF LEAK ?

Depending on the type of leak, different hole preparations and setting procedures may be required (see Specific Applications, Pages 5 to 7). Also, the type of leak is required to estimate the maximum pressure rating of the patch.

DESCRIBE THE LEAK (SIZE, DIAMETER, LENGTH, WIDTH, ETC.) ?

The size and shape of the leak is required to estimate the internal and external pressure that the patch will withstand hold. An impression packer can be run to determine the hole size..

TEMPERATURE ? DOWN HOLE AND ATMOSPHERIC ?

If the down hole temperature is higher than 325°F, a lead covered patch is recommended (see Page 17, High Temperature Applications). If it is less than 40°F, the epoxy may not set up or cure. In this case circulating warm water or oil may be required to cure the epoxy.

If the atmospheric temperature is below 32°F, be sure that the tool is drained of fluid when not in use. Severe damage of the setting equipment could result.

IS ADDITIONAL DRILLING PLANNED ?

The patch material is considerably softer than casing. Therefore, it is subject to wear easily while rotating thru it. If additional drilling is required, it is recommended that a down hole mud motor be used. This will reduce the possibility of wearing thru the patch.

WHAT EQUIPMENT WILL HAVE TO PASS THROUGH THE PATCH ?

The standard set patch reduces the inside diameter of the casing by 0.300 inches. The heavy wall patch when set will restrict the I.D. of the casing by 0.480 inch. This restriction must be considered when running future equipment thru the patch.

RIG SIZE, HEIGHT ? PULLING CAPACITY ?

Patches typically arrive at location in one piece (full length). Therefore, when dealing with long patches, it is important to determine (prior to shipment) if the rig is capable of picking up the patch in one piece.

If sufficient overpull is available, the patch can be successfully set even if the seals in the setting equipment fail after the first stroke. The force required to set the patch may be as high as 100,000 lbs.or more. This is why a strong work string is recommended. Normal setting rate ranges between 20,000 to 60,000 over string weight.

WORK STRING: PRESSURE RATING ?

The pressure required to set the patch may be as high as 5,000 psi.. Therefore, the work string and pump system should be rated to a minimum of 5,000 psi.. However, a pressure of 1,500 to 3,500 psi., applied to the setting tool, is normally required to set a patch. The work string must be clean and free of rust on the I.D. otherwise trash and rust will possibly plug the patch tool or interfere with the safety clutch in the bottom of the setting tool.

HOLE PREPARATIONS AND RECOMMENDATIONS BEFORE RUNNING THE PATCH

When preparing for a casing patch job, many questions and concerns should be considered carefully to determine which of the following runs are required to assure a successful patch. The questions and concerns are presented on Pages 3 thru 7. All of the following preparations are important in certain patch applications and many are recommended in all cases.

PREPARATIONS AND RECOMMENDATIONS FOR ALL PATCHES

(Separate Runs)

1. Locate and identify the leak. (see Page 14.)
2. Casing Scraper run (Mandatory).
3. API drift run (Mandatory).
4. A drift run with flush O.D. pipe larger in diameter than the unset patch and 25' longer than the patch length in a deviated hole.
5. Circulate to clean the well fluid.
6. If the well is making sand in or above the patch area, it must be stopped.

REQUIREMENTS FOR CERTAIN CASES

1. Wireline logs to correlate depth of leak and patch position.
2. Casing caliper log if I.D. of casing is questionable or restriction I.D. is unknown.
3. Casing corrosion log if severe corrosion is suspected.
4. Mill runs may be required to remove severe restrictions, or dress milled windows.
5. A casing swage should be run if the casing is partially collapsed above the area to be patched.
6. An impression block run is recommended to check alignment of parted casing.
7. When dealing with parted casing an alignment tool may be required.

LOCATING LEAKS AND CORRELATING DEPTH

Any of a wide variety of methods and equipment can be used to locate leaks, such as dual packers, plug and packer, RTTS tool, and various wireline logs. Some important considerations when choosing how to locate the leak(s) are as follows:

1. How reliable is the equipment?
2. Can accurate depth measurements be obtained and can they be repeated with the work string to be used while setting a patch?
3. Can it help to identify the type and size of the leak(s)?
4. Can it be used to identify areas (12-15') of good pipe within a leaking zone?
5. Can the casing string be tested above and below the leaking zone?
6. And most importantly: Can a casing patch be correlated or positioned within two feet based on depth measurements?

Correlating or positioning the patch is very critical. If the position of the patch is off by several feet, a slow leak may result. Always consider the difference in elevation when referring to old logs or well records. To assure proper placement you may want to consider a wireline gamma ray (with a radioactive sub or pup joint) for exact depth determination.

LENGTH OF PATCH

It is a HOMCO standard that the patch overlap the leak by 6 to 8 feet on each end. This is to assure a positive seal and allow for minor misplacements of the patch while setting.

In some special cases an overlap greater than 8 ft. may be recommended. Contact HOMCO's Casing Patch Manager in Houston when considering less than 6 ft. overlap.

When patching split or corroded pipe, it is recommended that the patch cover the full joint of casing with a 6 to 8 foot overlap at each end.

PRECAUTIONS WHILE RUNNING THE PATCH

Once casing patch is entered into the well bore, the rig operator should stop slowly at the end of each stand. If stopped quickly, the momentum of the patch may cause the patch to start setting.

Run slow and careful while passing through restrictions and deviations. Forcing the patch through restrictions or doglegs could possibly cause the patch to set prematurely. Use as little force as possible if the patch is dragging while running in the hole.

In low fluid level applications the effective differential pressure on the equipment should be considered. In some cases special equipment and techniques may be required.

STUCK IN THE HOLE

If for any reason when setting the patch, the patch tool becomes stuck or does not function, there are provisions or procedures to either complete setting the patch successfully, or to release the patch and retrieve the setting equipment.

If (after the first hydraulic stroke of the setting tool) the tool can no longer hold pressure, the patch can be completed by straight pull with the rig. This is the purpose of using a good strong work string.

If the patch cannot be completed with straight pull by the rig, the tool can be released by applying upward strain and 8 to 10 rounds of right hand torque which releases a safety joint just above the expander assembly, allowing the retrieval of the setting tool.

REMOVING A SET PATCH

If it becomes necessary to remove a patch, it can be milled out with taper mills or rotary shoes. The O.D. size of the mill or shoe should be between the casing drift diameter and 1/16" over drift.

SPECIAL PATCH APPLICATIONS

HIGH TEMPERATURE APPLICATIONS

(Geothermal and Steam Injection Wells)

The standard patch which utilizes an epoxy system is not recommended for use in applications where temperatures are above 325°F.

For applications between 325°F and 600°F special patches can be manufactured with a lead covering which provides the seal. In some cases special setting equipment may also be required.

High temperature patches are run in the same manner as standard patches. However, it is recommended that the work string be strong enough to set the patch, as a precaution to seal failure (due to heat) in the setting equipment, after the first stroke.

CORROSION RESISTANT PATCHES

Special Incoloy 825 Steel Patches can be manufactured which are highly corrosion resistant. Special setting equipment may be required in some cases. Typically these patches require more force or hydraulic pressure to be set if special equipment is not available. Incoloy Patches are run in the same manner as standard patches.

Contact HOMCO's Casing Patch Manager in Houston for Incoloy Patches.

EXTENDED LENGTH PATCHES

When the required patch length is longer than can be handled or picked up in the rig, special equipment and procedures are utilized to pick up the patch in two or more pieces, which are then welded together at the rig floor while running in the hole. Patches as long as 160 ft. have been set utilizing this method.

EXTENDED LENGTH PATCHES - (Cont'd).

SAFETY IS THE FIRST CONCERN WHEN CONSIDERING AN EXTENDED LENGTH PATCH.

When welding the patch sections together on the rig floor, the well is open to the atmosphere. For obvious reasons, if there is any chance of well control problems, Extended Length Patches are not recommended.

Welding the liner is very critical to the performance of the patch. Therefore, HOMCO certified welders are available worldwide, for both land and offshore.

Planning and preparation for Extended Length Patches is very critical. All potential problems must be considered for any patch, but in these cases to assure the best possible chances of success contact the HOMCO's Casing Patch Manager in Houston.

HEAVY WALL PATCHES

Heavy wall patches are the latest major development in HOMCO's Internal Casing Patch product line. Heavy wall patches were developed to withstand higher pressures.

These patches are made with 3/16" material and when set restrict the I.D. of the casing by 0.480 inch. Heavy wall patches have been manufactured in sizes ranging from 7" to 13-3/8" casing. They cannot be manufactured in sizes smaller than 7" casing.

Contact HOMCO's Casing Patch Manager for more information regarding heavy wall patches.

MULTIPLE PATCHES IN ONE WELL

Many patch applications require more than one patch in a given well. The general rule is to set the deepest patch first. However, if necessary a patch can be set below an existing patch.

POSSIBLE COMBINATIONS OF SPECIAL PATCHES

There are many possible combinations of the Special Patch Applications, such as a high temperature / heavy wall patch or an extended length / corrosion resistant patch. For any combination of Special Patch Applications, contact the HOMCO's Casing Patch Manager in Houston.

TESTING OF THE PATCH

It is recommended that the patch be set for 24 hours prior to testing. The test pressure should not be any higher than necessary. The differential pressure ratings listed on Page 20 are approximate failure points and should not be exceeded. Certain unknown down hole or casing conditions may adversely affect the pressure rating.

HOMCO CASING PATCH
PRESSURE CAPACITY

CASING O.D. (INCHES)	LINER WALL (INCHES)	LEAK SIZE (INCHES)	INTERNAL PSI	EXTERNAL PSI
2-7/8 & 3-1/2	1/16	1/2 or Less	10,672	1,950
		1	5,336	1,550
		2	2,668	1,150
		3	1,779	750
3-1/2	3/32	1/2 or Less	11,476	2,150
		1	5,738	1,750
		2	2,869	1,250
		3	1,913	750
4-1/2	1/8	1 or Less	9,850	2,500
		2	4,925	1,700
		3	3,283	800
5-1/2	1/8	1 or Less	9,850	1,850
		2	4,925	1,300
		3	3,283	750
6-5/8	1/8	1 or Less	9,850	1,200
		2	4,925	950
		3	3,283	700
7	1/8	1 or Less	9,850	1,100
		2	4,925	875
		3	3,283	650
7-5/8	1/8	1 or Less	9,850	1,000
		2	4,925	800
		3	3,283	600
8-5/8	1/8	1 or Less	9,850	900
		2	4,925	700
		3	3,283	550
9-5/8	1/8	1 or Less	9,850	800
		2	4,925	650
		3	3,283	500
10-3/4	1/8	1 or Less	9,850	750
		2	4,925	600
		3	3,283	450
13-3/8	1/8	1 or Less	9,850	600
		2	4,925	500
		3	3,283	400

This chart was based on a combination of experimental testing, field tests and engineering calculations. The complexity of thin-walled cylinder pressure rating calculations and the effects of unknown down hole parameters (such as leak size and shape, casing ovality, strength and support of the casing, etc.) do not allow exact determination of pressure ratings for the casing patch. The figures given in the chart are to be used as a guideline and are somewhat conservative for ideal circumstances. Therefore, the information herein does not constitute any guarantee on the part of HOMCO INTERNATIONAL, INC. Revision 8-19-91

HOMCO CASING PATCH

INTERNAL PRESSURE CAPACITY

			INTERNAL PRESSURE PROTECTION (PSI)			
PATCH WALL	PIPE O.D.	BURST EQUATION	1/2" HOLE	1" HOLE	2" HOLE	3" HOLE
1/16	2-7/8 & 3-1/2	$P = 5336/D$	10,672	5,336	2,668	1,779
3/32	3-1/2	$P = 5738/D$	11,476	5,738	2,869	1,913
1/8	4-1/2 - 13-3/8	$P = 9850/D$	19,700	9,850	4,925	3,283
3/16	7 - 13-3/8	$P = 15431/D$	30,862	15,431	7,716	5,144

BURST EQUATION

P = Internal Pressure Rating (PSI) With 20% Safety Factor

D = Diameter Of Leak

Example: Standard 1/8" Thick Patch Inside Casing Which Has 3/4" Perforations

$$P = 9850/D = 9850/.75 = 13,133 \text{ PSI}$$

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Revision 8-19-91 Engineering Department

Casing Patch-Case Histories

Location	Pipe Size	Repair Depth	Patch Length (Feet)	Remarks	Results of Pressure Test on Patch (PSI)
Intert Perforations					
Brunei, Indonesia	7"	2,580-4,676	10, 20, 30	3 Patches Set	3,800
Offshore Louisiana	7"	8,202-8,470	20, 20, 20	Block Squeeze Perforations, 3 Patches Set	2,000
North Sea	7"	10,350-10,597	30, 100, 100	3 Patches Set	
North Sea	7"	10,066-10,265	125, 60, 35	3 Patches Set, 58 Degree Hole Deviation	3,000
North Sea	7"	8,510-8,808	40, 70, 20, 60, 80	5 Patches Set, 46 Degree Hole Deviation	
Indonesia	7"	2,586-4,676	(4-10), (3-20), (2-30)	9 Patches Set	700
Mississippi	2 7/8"	4,482	40		2,200
Texas	2 7/8"	12,862	40	Misoriented Perforations in Dual Well	2,500
Rocky Mts.	5 1/2"	4,850	20	Temporary Patch So Lower Sand Could Be Tested. Patch Perforated After Test	
Oklahoma	7"	8,550	30	Obsolete Perforations	1,000
Brunei, North Borneo	7"	8,640	50		3,000
Chili	7"	200	10		2,200
Split Tubing/Casing					
Canada	7"	1,045	20	Lead Seal Patch	
Texas	9 5/8"	9,142	60	30 Degree Hole Deviation	
Texas	2 7/8"	1,712	30	Split Tubing in Dual Well	1,500
Louisiana	7"	1,768	20	Split Pipe	2,000
Louisiana	10 1/4"	633	40	Split 30 Ft.	1,000
Leaking Tubing/Casing					
Southern California	13 3/8"	510	30	High Temperature-Lead Covered 3/16" Wall Liner	
Offshore Alabama	13 3/8"	1,590	100		1,000
Texas	3 1/2"	3,900	20	Thread Leak	4,500
Floating Vessel	5 1/2"	300	10	8 Cement Jobs Attempted in 31 Days, Patch Operation Complete in 7 Hours	
Chile	7"	1,075	10		1,000
					2,200
Corrosion					
Canada	5 1/2"	4,881	40	Lead Seal Patch	
Louisiana	7"	1,490	10	Salt Water Disposal Well	500
Dubai	9 5/8"	4,802	20	39 Degree Hole Deviation, Low Fluid Level Well	
California	8 5/8"	1,887	30		750
Louisiana	9 5/8"	9,342	10		2,600
Louisiana	7"	5,506	20	9 St Corrosion	
Parted Pipe					
Wyoming	7"	5,000	30	12 St Part	250
Louisiana	7 5/8"	300	10	Patch Covered a 30" Separation in Fiber Glass Casing	
Leaking Cement Valve					
Texas	4 1/2"	2,100	20	DV Tool Leaking	1,000
Texas	7"	1,985	20	DV Tool Leaking	
Deepest Patch					
Louisiana	7"	16,300	30	Unwanted Perforations	

HOMCO STEEL CASING PATCH

495-000

Tl. Size	Part No	Tubing or Casing Size				Spring Collet	Liner		Wall	Patched ID Ins.	
		O. D. Ins.	Liner	O. D. Ins.	Wt. Lbs.		I. D. Ins.	Ptchd. I. D. Ins.	Min. Csg. I.D. to pass Collet w/C Max	Clpsed. Ins.	
8 Corrugations/Liner	2 1/8	602-242	2 7/8	6.4	2.441	2.257	2.422	2.266	2.125	1.250 .065	
	2 1/8	604-109	2 7/8	6.5	2.441	2.257	2.366	2.234	2.031	1.250 .065 2.191	
	2 1/8	604-117	3 1/2	9.3	2.992	2.752	2.891	2.703	2.638	1.250 .089 2.680	
	2 1/8	604-084	3 1/2	10.3	2.922	2.682	2.844	2.065	2.600	1.250 .089 2.638	
	2 1/8	604-113	3 1/2	12.95	2.750	2.510	2.656	2.469	2.407	1.250 .089 2.447	
	2 1/8	604-114	3 1/2	15.8	2.548	2.348	2.475	2.344	2.269	1.250 .065 2.301	
	2 1/8	604-115	3 1/2	16.7	2.480	2.280	2.400	2.250	2.190	1.250 .065 2.222	
	2 1/8	604-109	3 1/2	17.05	2.440	2.257	2.366	2.234	2.031	1.250 .065 2.191	
	3 1/2	602-071	4 1/2	9.5	4.090	3.790	3.980	3.810	3.500	2.375 .120	
	3 1/2	602-071	4 1/2	10.5	4.050	3.750	3.938	3.766	3.500	2.375 .120	
	3 1/2	606-574	4 1/2	11.6	4.000	3.700	3.828	3.656	3.437	2.375 .120	
	3 1/2	606-575	4 1/2	13.5	3.920	3.620	3.750	3.625	3.437	2.375 .120	
	3 1/2	604-497	5	13.0	4.494	4.194	4.422	4.250	3.938	2.750 .120	
	3 1/2	603-004	5	15.0	4.408	4.108	4.250	4.078	3.875	2.500 .120	
	3 1/2	603-024	5	18.0	4.276	3.976	4.125	3.953	3.750	2.500 .120	
	4 1/2	602-238	5 1/2	14.0	5.012	4.712	4.875	4.656	4.375	3.000 .120	
	4 1/2	602-238	5 1/2	15.5	4.950	4.650	4.812	4.609	4.375	3.000 .120	
	4 1/2	602-239	5 1/2	17.0	4.892	4.592	4.766	4.562	4.250	2.750 .120	
	4 1/2	602-239	5 1/2	20.0	4.778	4.478	4.641	4.437	4.250	2.750 .120	
	3 1/2	604-082	5 1/2	23.0	4.670	4.370	4.547	4.344	4.125	2.750 .120	
	4 1/2	606-761	5 3/4	17.0	5.196	4.896	5.062	4.850	4.375	3.000 .120	
	4 1/2	602-238	5 3/4	22.5	4.990	4.690		4.375	3.000	.120	
10 Corrugations/Liner	5 1/2	606-550	6 5/8	20.0	6.049	5.749	5.891	5.718	5.375	4.187 .120	
	5 1/2	602-030	6 5/8	24.0	5.921	5.621	5.766	5.593	5.375	4.187 .120	
	5 1/2	602-063	6 5/8	28.0	5.791	5.491	5.672	5.500	5.125	3.500 .120	
	5 1/2	602-063	6 5/8	32.0	5.675	5.375		5.125	3.500	.120	
	4 1/2	606-476	6 5/8	34.0	5.595	5.295	5.438	5.250	5.125	4.000 .120	
	5 1/2	602-028	7	17.0	6.538	6.238	6.400	6.205	5.875	4.187 .120	
	5 1/2	602-028	7	20.0	6.456	6.156	6.312	6.094	5.875	4.187 .120	
	5 1/2	602-028	7	22.0	6.398	6.098	6.250	6.031	5.875	4.187 .120	
	5 1/2	601-873	7	23.0	6.366	6.066	6.250	6.031	5.750	4.187 .120	
	5 1/2	601-873	7	24.0	6.336	6.036	6.250	6.031	5.750	4.187 .120	
	5 1/2	601-873	7	26.0	6.276	5.976	6.172	5.938	5.750	4.187 .120	
	5 1/2	601-873	7	28.0	6.214	5.914		5.750	4.187	.120	
	5 1/2	602-029	7	29.0	6.184	5.884	6.031	5.828	5.500	4.187 .120	
	5 1/2	602-029	7	32.0	6.094	5.790	5.953	5.766	5.500	4.187 .120	
	5 1/2	602-030	7	35.0	6.004	5.704		5.375	4.187	.120	
	5 1/2	602-030	7	38.0	5.920	5.621	5.766	5.562	5.375	4.187 .120	
	5 1/2	601-883	7 5/8	26.4	6.969	6.669	6.872	6.609	6.250	4.500 .120	
	5 1/2	601-883	7 5/8	29.7	6.875	6.575	6.719	6.516	6.250	4.500 .120	
	5 1/2	602-172	7 5/8	33.7	6.765	6.465	6.625	6.406	6.062	4.375 .120	
	5 1/2	602-172	7 5/8	39.0	6.625	6.325	6.469	6.266	6.062	4.375 .120	
	5 1/2	602-409	8 5/8	24.0	8.097	7.797	7.906	7.734	7.312	5.312 .120	
	5 1/2	602-409	8 5/8	28.0	8.017	7.717	7.844	7.641	7.312	5.312 .120	
	5 1/2	601-835	8 5/8	32.0	7.921	7.621	7.750	7.562	7.125	5.125 .120	
	5 1/2	601-835	8 5/8	36.0	7.825	7.525	7.688	7.500	7.125	5.125 .120	
	5 1/2	601-836	9 5/8	32.3	9.001	8.701	8.828	8.625	8.125	6.125 .120	
	5 1/2	601-836	9 5/8	36.0	8.921	8.621	8.750	8.547	8.125	6.125 .120	
	5 1/2	601-836	9 5/8	40.0	8.835	8.535	8.656	8.469	8.125	6.125 .120	
	5 1/2	603-127	9 5/8	43.5	8.755	8.455	8.578	8.391	7.875	5.875 .120	
	5 1/2	603-127	9 5/8	47.0	8.681	8.381	8.500	8.312	7.875	5.875 .120	
	5 1/2	603-127	9 5/8	53.5	8.535	8.235	8.375	8.172	7.875	5.875 .120	
	5 1/2	601-840	10 3/4	32.75	10.192	9.892		9.250	6.750	.120	
	5 1/2	601-840	10 3/4	40.5	10.050	9.750	9.875	9.703	9.250	6.750 .120	
	5 1/2	601-841	10 3/4	45.5	9.950	9.650	9.781	9.609	9.000	6.500 .120	
	5 1/2	601-841	10 3/4	51.0	9.850	9.550	9.672	9.500	9.000	6.500 .120	
	5 1/2	606-535	10 3/4	55.5	9.760	9.460	9.620	9.450	8.750	6.500 .120	
	5 1/2	606-535	10 3/4	60.7	9.660	9.360	9.500	9.344	8.750	6.500 .120	
	5 1/2	606-372	10 3/4	71.1	9.450	9.150	9.281	9.125	8.875	6.375 .120	
	5 1/2	604-675	12 3/4	65.42	11.750	11.450	11.578	11.375	10.750	8.000 .120	
	5 1/2	605-226	13 3/8	54.50	12.615	12.315	12.438	12.266	11.500	8.750 .120	
	5 1/2	606-226	13 3/8	61.0	12.515	12.215	12.375	12.188	11.500	8.750 .120	
	5 1/2	605-226	13 3/8	68.0	12.415	12.115	12.250	12.062	11.500	8.750 .120	
	5 1/2	606-194	13 3/8	72.0	12.347	12.047	12.172	12.000	11.250	8.500 .120	
	5 1/2	606-194	13 3/8	85.0	12.139	11.839	11.969	11.781	11.250	8.500 .120	

HOMCO Service and Rental Locations

Casing Patch Manager: Houston: Phone: (713) 485-1899

Michigan
Kalkaska: Phone: (616) 258-8691
Fax: (616) 258-5455

California
Bakersfield: Phone: (805) 589-2511
Fax: (805) 589-2046

Brawley: Phone: (619) 344-7550
Fax: (619) 344-6323

Long Beach: Phone: (213) 595-5779
Fax: (213) 426-6208

Santa Paula: Phone: (805) 933-1307
Fax: (805) 525-5044

Colorado
Grand Junction:
Phone: (303) 245-0366
Fax: (303) 245-8632

Kansas
Great Bend: Phone: (316) 793-7819
Fax: (316) 792-4347

Liberal: Phone: (316) 624-6273
Fax: (316) 624-6606

Plainville: Phone: (913) 434-4543
(913) 434-2212

Louisiana
Harvey: Phone: (504) 367-9500
Fax: (504) 366-8454

Houma (Fishing):
Phone: (504) 876-1841
Fax: (504) 868-2908

Houma (Rental):
Phone: (504) 879-1545
Fax: (504) 873-8128

Lafayette: Phone: (318) 232-7770
Fax: (318) 367-9974

Lake Charles: Phone: (318) 436-3351
Fax: (318) 433-6532

New Iberia: Phone: (318) 364-8171
Fax: (318) 364-8174

Venice: Phone: (504) 534-7475
Fax: (504) 534-7748

Michigan
Kalkaska: Phone: (616) 258-8691
Fax: (616) 258-5455

Mississippi
Laurel: Phone: (601) 425-4685
Fax: (601) 425-4687

Nevada
Elko: Phone: (702) 738-7033

New Mexico
Farmington: Phone: (505) 327-6341
Fax: (505) 327-7503

Hobbs: Phone: (505) 393-3107
Fax: (505) 392-4218

Hobbs (L&M): Phone: (505) 392-5521
Fax: (505) 392-5524

North Dakota
Dickinson: Phone: (701) 225-6891
Fax: (701) 225-3611

Williston: Phone: (701) 572-6714
Fax: (701) 572-0220

Oklahoma
Elk City: Phone: (405) 225-4484
Fax: (405) 225-1223

Enid: Phone: (405) 234-6067
Fax: (405) 242-2717

Lindsay: Phone: (405) 756-4389
Fax: (405) 756-8268

Oklahoma City: Phone: (405) 677-2426
Fax: (405) 672-1577

Velma: Phone: (405) 444-3345
Fax: (405) 444-3347

Wilburton: Phone: (915) 465-2311
Fax: (915) 465-2159

Woodward: Phone: (405) 256-7433
Fax: (405) 256-8658

Texas
Alice: Phone: (512) 664-5411
Fax: (512) 664-4385

Andrews: Phone: (915) 523-7961
Fax: (915) 523-3109

Edinburg: Phone: (512) 383-4991
Fax: (512) 383-0035

Kilgore: Phone: (903) 984-4486
Fax: (903) 984-8699

Laredo: Phone: (512) 722-0738
Fax: (512) 725-4853

Odessa: Phone: (915) 337-3546
Fax: (915) 337-4533

Odessa (L&M): Phone: (915) 332-1511
Fax: (915) 334-8739

Palestine: Phone: (903) 729-3241
Fax: (903) 729-3509

Pearland: Phone: (713) 485-1899
Fax: (713) 485-4827

Snyder: Phone: (915) 573-3563
Fax: (915) 573-7263

Sonora: Phone: (915) 387-3503
Fax: (915) 387-3506

Victoria: Phone: (512) 573-3238
Fax: (512) 573-9598

Wichita Falls: Phone: (817) 692-4541
Fax: (817) 692-0669

Utah
Vernal: Phone: (801) 789-0445
Fax: (801) 789-3612

Wyoming
Big Piney: Phone: (307) 276-5324
Fax: (307) 276-5385

Casper: Phone: (307) 473-1250
Fax: (307) 473-1030

Evanston: Phone: (307) 789-9060
Fax: (307) 789-0204

Gillette: Phone: (307) 682-4701
Fax: (317) 682-6973

Powell: Phone: (307) 754-2249
Fax: (307) 754-9695

Rock Springs: Phone: (307) 362-5664
Fax: (307) 362-6862

HOMCO General Offices

Mailing Address:
P.O. Box 2442
Houston, Texas 77252

Street Address:
4710 Bellaire Blvd., Suite 200
Bellaire, Texas 77401

Phone: (713) 663-6444
Fax: (713) 663-5595
Telex: 790-701

J. Sales Offices

California

Ventura:
Phone: (805) 650-6427
Fax: (805) 650-6906

Louisiana

Lafayette:
Phone: (318) 235-9811
Fax: (318) 232-0251

Texas

Corpus Christi:
Phone: (512) 887-8153

Colorado

Denver:
Phone: (303) 825-6558
Fax: (303) 892-9299

New Orleans:

Phone: (504) 585-7339
Fax: (504) 585-7301

Dallas/Ft. Worth:

Phone: (214) 630-8857
Fax: (214) 630-8850

Oklahoma

Oklahoma City:
Phone: (405) 677-8388
Fax: (405) 670-2501

Houston:

Phone: (713) 661-8298
Fax: (713) 666-3276

Midland:

Phone: (915) 683-1604
Fax: (915) 683-2205

Tyler:

Phone: (903) 597-0340

Sea Oil HOMCO Limited

Aberdeen, Scotland: Aberdeen 224 724900

HOMCO International Ltd (Canada)

General Offices

P.O. Box 250
511 13 Avenue
1, Alberta T0C-2G0

Phone: (403) 955-7766
Fax: (403) 955-2073
Telex: 037-2112

* = Supply Store Locations

Alberta

Brooks: (403) 362-8880
*Calgary: (403) 262-3901; Fax: (403) 265-7157
Grand Prairie: (403) 539-3163
High Level: (403) 926-2772
*Lloydminster: (403) 875-6151; Fax: (403) 875-2743
*Nisku: (403) 955-7933; Fax: (403) 955-2073
Red Deer: (403) 341-4442
Rocky Mountain House: (403) 845-7115
Whitecourt: (403) 778-3880

British Columbia

Fort St. John: (604) 785-4613

Newfoundland

St. John's: (709) 364-3311

Nova Scotia

Dartmouth: (902) 468-4606

Saskatchewan

Estevan: (306) 634-2924

A-1 BIT & TOOL Division

Great Yarmouth, England:

Phone: 44-0493-659810
Fax: 44-0493-440532

Aberdeen, Scotland:

Phone: 44-224-874236
Fax: 44-224-898527

IJmuiden, Netherlands:

Phone: 31-2550-35554
Fax: 31-2550-10233

Stavanger, Norway:

Phone: 47-4-697050
Fax: 47-4-697270

Celle, Germany:

Phone: 49-5141-84055
Fax: 49-5141-881785

Milano, Italy:

Phone: 39-377-451110
Fax: 39-377-451104

Singapore:

Phone: 65-543-0566
Fax: 54-545-3848

Jakarta:

Phone: 62-21-520-5866
Fax: 62-21-570-4659



HOMCO

I. GENERAL DESCRIPTION

In repairing a leak in oil well casing or tubing of an oil well or in sealing unused perforations, several methods may be employed. The latest development is the placement of a steel liner to serve as a patch.

The Homco Steel Casing Patch tool was designed from an invention developed by the Pan American Corporation.

The tool consists of a chamber, which, under pressure, contains pistons that exert a motion in an upward direction. This motion moves a cone and spring collet and expands a longitudinally corrugated liner. This liner, which is covered with fiberglass cloth and coated with epoxy resin, remains in place as a permanent liner or patch in the casing.

Seals formed by this method have been successfully tested up to 5000 psi over a 1" diameter hole. Naturally, the larger the hole to be sealed, the less pressure it will withstand.

Casing Size Inches-Lbs.	Casing I.D.	Tool O.D. Inches	Patch O.D. Before Corrugations	Patch Wall Thickness - (Minus - Fiber- glass) Inches	Pressure Ratio	Red. in I.D. inches
2 3/8-4.7	1.950	1 3/4	2	0.065	5.26 to 1	0.170
2 7/8-6.4	2.441	2 1/8	2.500	0.065	5.4 to 1	0.170
2 7/8-6.5	2.441	2 1/8	2.441	0.065	5.4 to 1	0.170
2 7/8-7.9	2.323	1 3/4	2.323	0.065	5.26 to 1	0.170
2 7/8-8.7	2.259	1 3/4	2.250	0.065	5.26 to 1	0.170
2 7/8-10.7	2.091	1 3/4	2.091	0.065	5.26 to 1	0.170
3 1/2-9.3	2.992	2 1/8	2.992	0.065	5.4 to 1	0.170
3 1/2-10.3	2.922	2 1/8	2.948	0.065	5.4 to 1	0.170
3 1/2-12.95	2.750	2 1/8	2.750	0.065	5.4 to 1	0.170
3 1/2-15.8	2.548	2 1/8	2.548	0.065	5.4 to 1	0.170
3 1/2-16.7	2.480	2 1/8	2.480	0.065	5.4 to 1	0.170
3 1/2-17.05	2.441	2 1/8	2.441	0.065	5.4 to 1	0.170
4 1/2-9.5	4.090	3 1/2	4.125	0.120	12 to 1	0.300
4 1/2-10.5	4.050	3 1/2	4.125	0.120	12 to 1	0.300
4 1/2-11.6	4.000	3 1/2	4.032	0.120	12 to 1	0.300
4 1/2-13.5	3.920	3 1/2	4.032	0.120	12 to 1	0.300
5 -13	4.494	3 1/2	4.520	0.120	12 to 1	0.300
5 -15	4.408	3 1/2	4.500	0.120	12 to 1	0.300
5 -18	4.276	3 1/2	4.319	0.120	12 to 1	0.300
5 1/2-14	5.012	4 1/2	5.060	0.120	12 to 1	0.300
5 1/2-15.5	4.950	4 1/2	5.060	0.120	12 to 1	0.300
5 1/2-17	4.892	4 1/2	4.921	0.120	12 to 1	0.300
5 1/2-20	4.778	4 1/2	4.921	0.120	12 to 1	0.300
5 1/2-23	4.670	3 1/2		0.120	12 to 1	0.300
5 3/4-22.5	4.990	4 1/2	5.060	0.120	12 to 1	0.300

Casing Size Inches-Lbs.	Casing I.D. Inches	Tool O.D. Inches	Patch O.D. Before Corrugations	Patch Wall Thickness - (Minus - Fiber- glass) Inches	Pressure Ratio	Reduction in I.D. Inches
6 5/8-28	5.791	5 1/2	5.845	0.120	29 to 1	0.300
6 5/8-32	5.675	5 1/2	5.845	0.120	29 to 1	0.300
6 5/8-20	6.049	5 1/2	6.140	0.120	29 to 1	0.300
6 5/8-24	5.921	5 1/2	6.085	0.120	29 to 1	0.300
6 5/8-34	5.595	4 1/2	5.680	0.120	29 to 1	0.300
7 -35	6.004	5 1/2	6.085	0.120	29 to 1	0.300
7 -17	6.538	5 1/2	6.577	0.120	29 to 1	0.300
7 -20	6.456	5 1/2	6.577	0.120	29 to 1	0.300
7 -24	6.336	5 1/2	6.405	0.120	29 to 1	0.300
7 -26	6.276	5 1/2	6.405	0.120	29 to 1	0.300
7 -28	6.214	5 1/2	6.405	0.120	29 to 1	0.300
7 -29	6.184	5 1/2	6.218	0.120	29 to 1	0.300
7 -32	6.094	5 1/2	6.218	0.120	29 to 1	0.300
7 -38	5.920	5 1/2	6.085	0.120	29 to 1	0.300
7 -23	6.366	5 1/2	6.405	0.120	29 to 1	0.300
7 -22	6.398	5 1/2	6.577	0.120	29 to 1	0.300
7 5/8-26.4	6.969	5 1/2	7.062	0.120	29 to 1	0.300
7 5/8-29.7	6.875	5 1/2	7.062	0.120	29 to 1	0.300
7 5/8-33.7	6.765	5 1/2	6.812	0.120	29 to 1	0.300
7 5/8-39	6.625	5 1/2	6.812	0.120	29 to 1	0.300
8 5/8-24	8.097	5 1/2	8.187	0.120	29 to 1	0.300
8 5/8-28	8.017	5 1/2	8.187	0.120	29 to 1	0.300
8 5/8-32	7.921	5 1/2	8.000	0.120	29 to 1	0.300
8 5/8-36	7.825	5 1/2	8.000	0.120	29 to 1	0.300
9 5/8-32.3	9.001	5 1/2	9.062	0.120	29 to 1	0.300
9 5/8-36	8.921	5 1/2	9.062	0.120	29 to 1	0.300
9 5/8-40	8.835	5 1/2	9.062	0.120	29 to 1	0.300
9 5/8-43.5	8.755	5 1/2	8.817	0.120	29 to 1	0.300
9 5/8-47	8.681	5 1/2	8.817	0.120	29 to 1	0.300
9 5/8-53.5	8.535	5 1/2	8.817	0.120	29 to 1	0.300
10 3/4-32.75	10.192	5 1/2	10.285	0.120	29 to 1	0.300
10 3/4-40.5	10.050	5 1/2	10.285	0.120	29 to 1	0.300
10 3/4-45.5	9.950	5 1/2	10.047	0.120	29 to 1	0.300
10 3/4-51	9.850	5 1/2	10.047	0.120	29 to 1	0.300
10 3/4-71.1	9.450	5 1/2	9.594	0.120	29 to 1	0.300
12 3/4-65.42	11.750	5 1/2	11.812	0.120	29 to 1	0.300
13 3/8-54.50	12.615	5 1/2	12.740	0.120	29 to 1	0.300
13 3/8-72	12.347	5 1/2	12.472	0.120	29 to 1	0.300

Patch lengths available: Any multiple of 10 feet, but limited by rig height.

II. OPERATING INSTRUCTIONS

Once the exact depth that the repair to be made is known, proceed as follows:

Step 1: Well Preparation

- a. The area of the leak should be cleaned with a casing scraper about 15' above and below the patch area. This removes cement cake, perforations burrs, and other solids from the casing wall.
- b. A gage ring with an O.D. not less than casing I.D. minus 1/8" should be run above the scraper to assure free passage of the repair tool.

Step 2: Tool Assembly at Field Site

The tool will arrive at location fully assembled in its major parts. Slide Valve, Bumper Jar, and Hold Down and Cylinder Assembly will each be ready to couple together.

Now, please refer to Figure 1 - "General Schematic".

When preparing the tool as shown in a place convenient to the rig elevator, assemble the tool from "top sub" to the "polish rod coupling". (Both places are marked by arrows on left side of the sketch.) Cover the well bore to prevent dropping objects down hole.

- a. Raise the tool with the elevators and lift into the derrick, then be sure that the lower polish rod is fully extended.
- b. Add extensions to the polish rod coupling to accomodate the length of patch to be used. In computing the needs, remember that the safety joint will add about 12" to 18" to this length. The safety joint is also added at this time. The overall length of the available space for the patch must be about 4" to 14" longer than the patch.
- c. Raise the tool. Several crew men now hold the patch under the tool. Slowly lower the tool inside the liner.
- d. When the tool is through the liner, slide the Solid Cone and Spring Collet with sleeve over the safety joint. Now secure the nose piece on the bottom of the safety joint. To do this, use a wrench on the bottom most part of the safety joint and one wrench on the nose piece. This will prevent a disengagement of the safety joint's left hand thread.
- e. The epoxy mix is now prepared. Pour the catalyst from the quart can into the resin in the gallon can. Stir thoroughly for about three minutes. One can of each is sufficient for about 10' to 15' of liner. Remove the cover from the well bore. Apply the epoxy mixture on the fiberglass of the liner by using rubber gloves as the tool is being lowered. Rub it into the fibers as completely as possible. Lower the tool down hole to the depth required at standard rates: 2500 feet per hour.

APPENDIX J

WESTERN ATLAS PERFORATING CHARGE PERFORMANCE



Prepared for: GEI

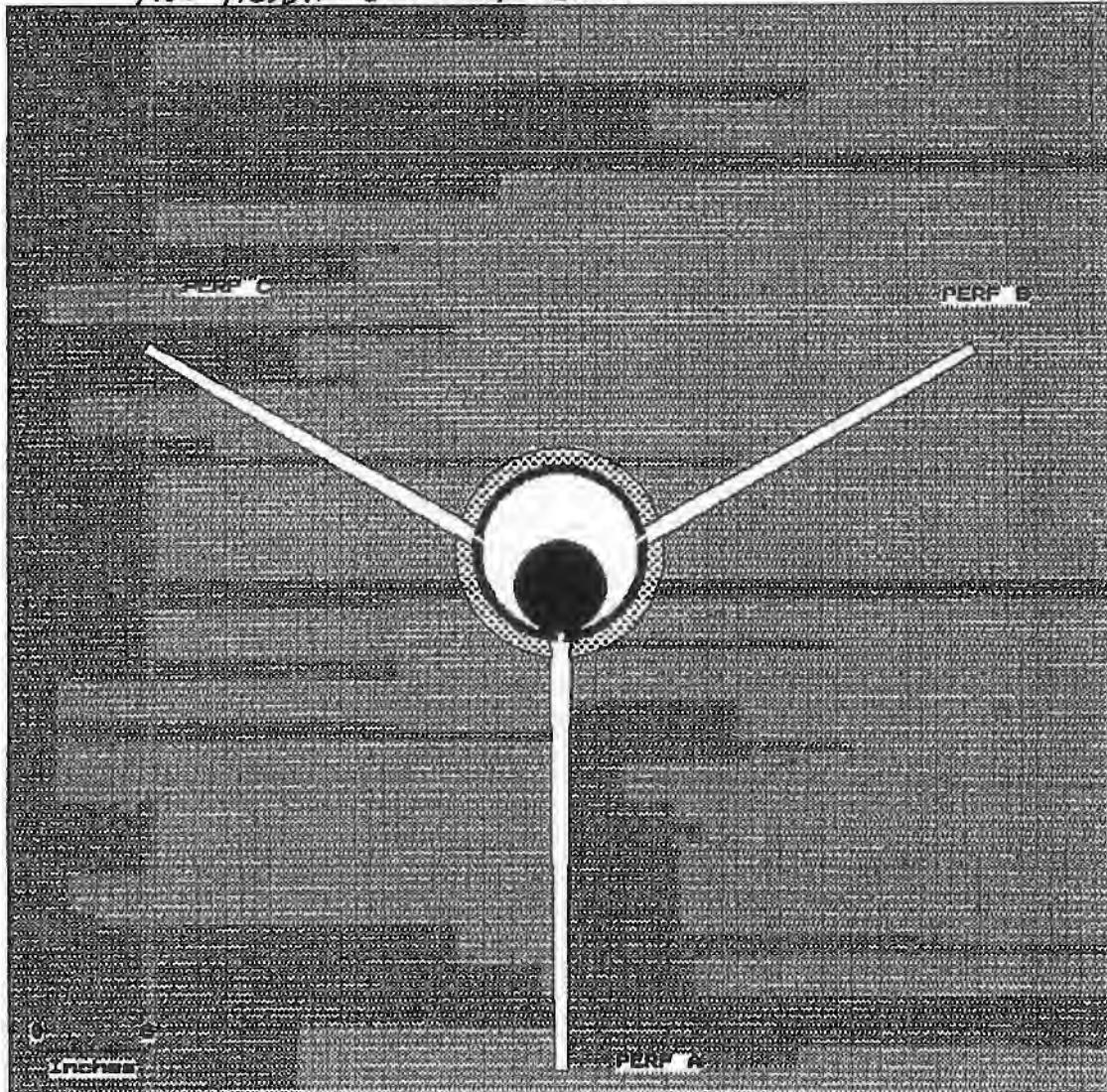
BY: HILL

PERFORATING PARAMETERS

GUN: 5" Super Omnikone 5SPF PART NUMBER: 150025-000
FIRING PHASE = 120. GUN IS OFF-CENTER IN TUBING
BOREHOLE= 11.500 FORMATION COMP. STRENGTH= 2793.
STRING: 1 9.625 OD 43.50 LBS./FT. GRADE: N80
FLUID IN STRING 1 IS Water (8.34 lbs/gal)
BOREHOLE FILLED WITH Cement IS 0.94 INCHES THICK MIN.
This prediction of perforation performance does not account for
insitu formation stresses and pressures.

PREDICTED PERFORMANCE FOR	PERF	PERF	PERF
SAND	A	B	C
TOTAL TARGET PENETRATION	24.23	21.06	21.06
FORMATION PENETRATION	22.84	19.60	19.60
ENTRY HOLE DIA. IN STRING 1	0.40	0.36	0.36
AV. TUNNEL DIA. IN FORMATION	1.19	1.02	1.02

ROTATION FACTOR IS 0. DEGREES

Not Actual Shot Pattern

APPENDIX K

**DIAGNOSTIC RADIOACTIVE TRACER SURVEY
AND WESTERN ATLAS' LOG INTERPRETATION**





ATLAS
WIRELINE
SERVICES

PRODUCTION
LOGGING
SERVICES

FILE NO.	CELANESE BAY CITY PLANT		
93015	COMPANY	WELL	DISPOSAL WELL NO. 1-A
API NO.	CELANESE PLANT	FIELD	CELANESE PLANT
COUNTY	MATAGORDA	STATE	TEXAS

PERMANENT DATUM	GL	ELEV.	N/A
LOGGING MEASURED FROM	RKB	17	FT. ABOVE P.D.
DRILLING MEASURED FROM	RKB		

ELEVATIONS
KB N/A
DF N/A
GL N/A

IN MAKING INTERPRETATIONS OF LOGS OUR EMPLOYEES WILL GIVE CUSTOMER THE FIT OF THEIR BEST JUDGEMENT, BUT SINCE THE INTERPRETATIONS ARE OPINIONS BASED ON INFERENCES FROM ELECTRICAL OR OTHER MEASUREMENTS, WE CANNOT, AND WE DO NOT GUARANTEE THE ACCURACY OR CORRECTNESS OF ANY INTERPRETATION. WE SHALL NOT BE LIABLE OR RESPONSIBLE FOR ANY LOSS, COST, DAMAGES, OR EXPENSES WHATSOEVER INCURRED OR SUSTAINED BY THE CUSTOMER RESULTING FROM ANY INTERPRETATION MADE BY ANY OF OUR EMPLOYEES.

FINAL PRINT

COMPANY	CELANESE BAY CITY PLANT
WELL	DISPOSAL WELL NO. 1-A
FIELD	CELANESE PLANT
COUNTY	MATAGORDA
LOCATION:	STATE TEXAS
NA	OTHER SERVICES

R.A.T. + HP PRESSURE

FOLD HERE

CASING RECORD

REMARKS RUN (1)

R.A.T. SHOWS NO MOVEMENT BEHIND OR INTO AREA OF SQ. PERFS. HP (REF. TO GL 0) AT 3440 = 1592.94 P.S.I.

CALIBRATION FOR HP BELOW

CALIBRATION FOR HP BELOW

LOG NAME HP ASSET NO. 07530 UNIT NO. SHOP CAL
 CALIBRATION ENTERED ON 01/20/93 AT 05:25:47

TEMPERATURE COEFFICIENTS

DATE	CALIBRATION	TIME	
01/20/93		05:25:47	
G0	H0	I0	J0
5.67607E 05	1.05659E 02	-2.97454E-04	4.43237E-09
G1	H1	I1	J1
1.17530E 00	-2.51190E-03	1.22594E-06	-6.75704E-11
G2	H2	I2	J2
8.11190E-03	2.77126E-05	-6.14214E-09	3.41897E-13
G3	H3	I3	J3
1.69716E-05	-1.09611E-07	1.04629E-11	-5.51081E-16
G4	H4	I4	J4
-3.60792E-11	-7.29141E-15	7.51928E-19	-4.64593E-23

MUD PRESSURE CORRECTION
 0.0000 PSI

*** FDN NOT CALIBRATED ***

*** HP PRESSURE ***

STABILIZED PRESSURE TAKEN
 AT 3440 FT. (REF. GL)
 TOOL STABILIZED FOR 920 SEC.,
 FINAL P.S.I.A. = 1592.94
 (TOP OF FLUID COLUMN AT 357 FT.
 , 10 LB. BRINE., GL DEPTH)

NOTE: TIME MODE IS PRESENTED
 AT 1 SEC./FT.

FILE: 1

COMPANY:	CELANESE BAY CITY PLANT	RUN:	1
WELL NAME:	DISPOSAL WELL NO. 1-A	TRIP:	1
SERVICE:	A 433B	FILE:	1
REVISION:	FSYS256 REV:G002 VER:2.0	DATE:	01/20/93
DEPTH:	3437	TIME:	20:28:53
		MODE:	RECORD

CCL

20000

TEMP (DEG F)

120

140

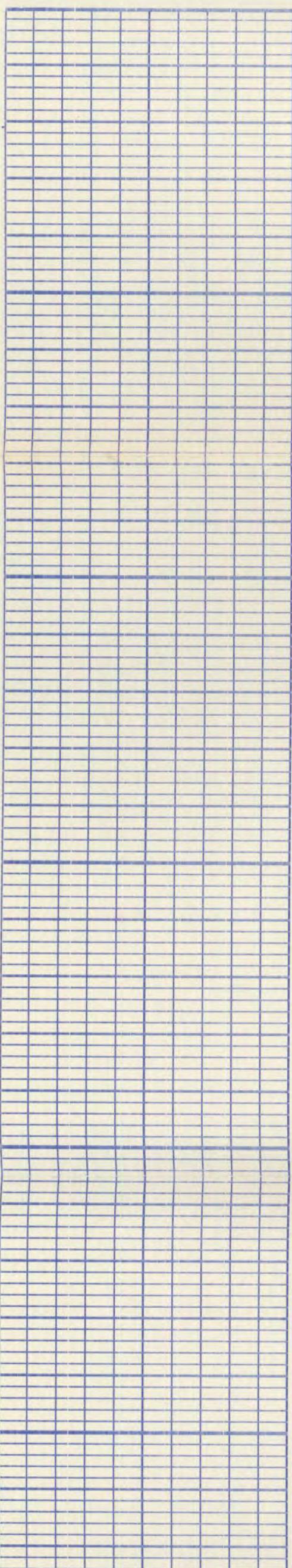
HPCP (PSIA)

1500

1600

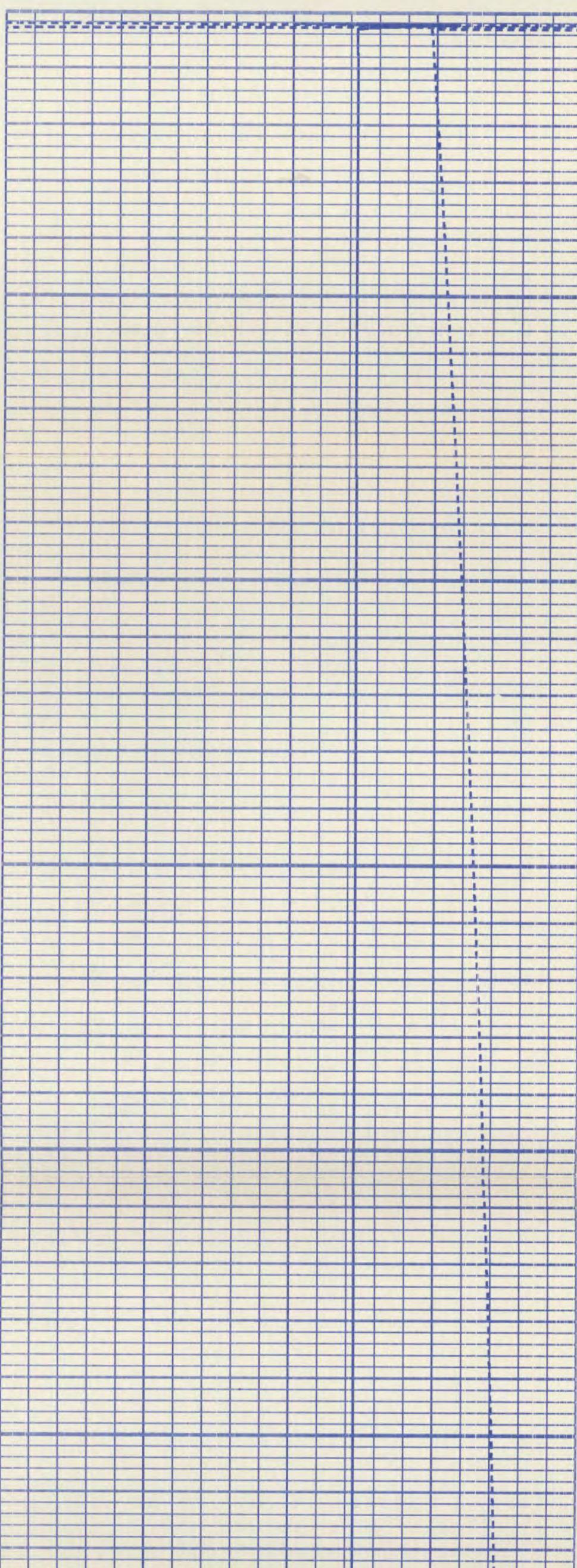
1500

1600



00100

00200



00300

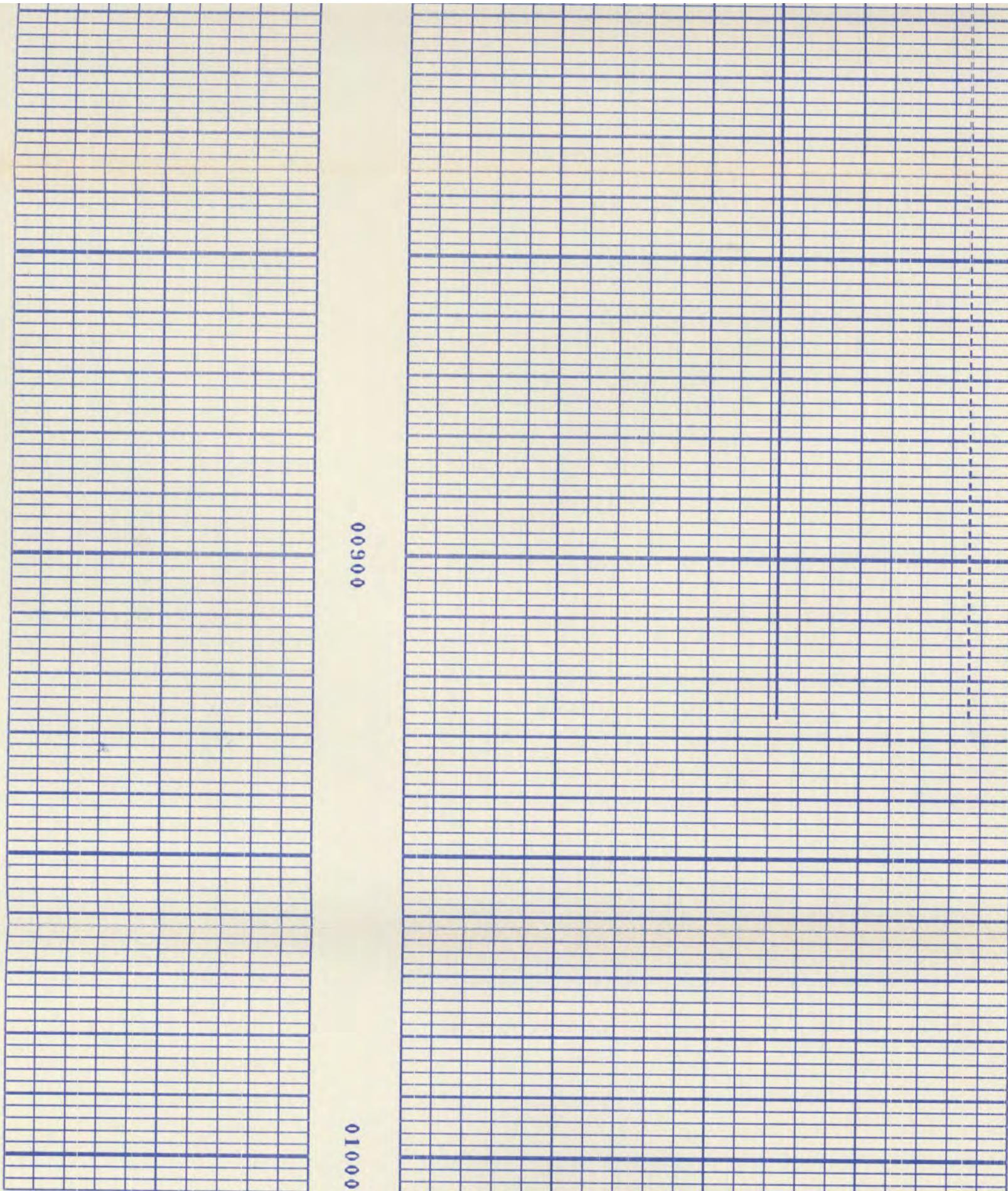
00400

00500

00600

00700

00800



CCL
20000

TEMP (DEG F)

120

140

HPCP (PSIA)

1500

1600

DISPLAY SCALE CHANGES

** DATA FROM R.A.T. **

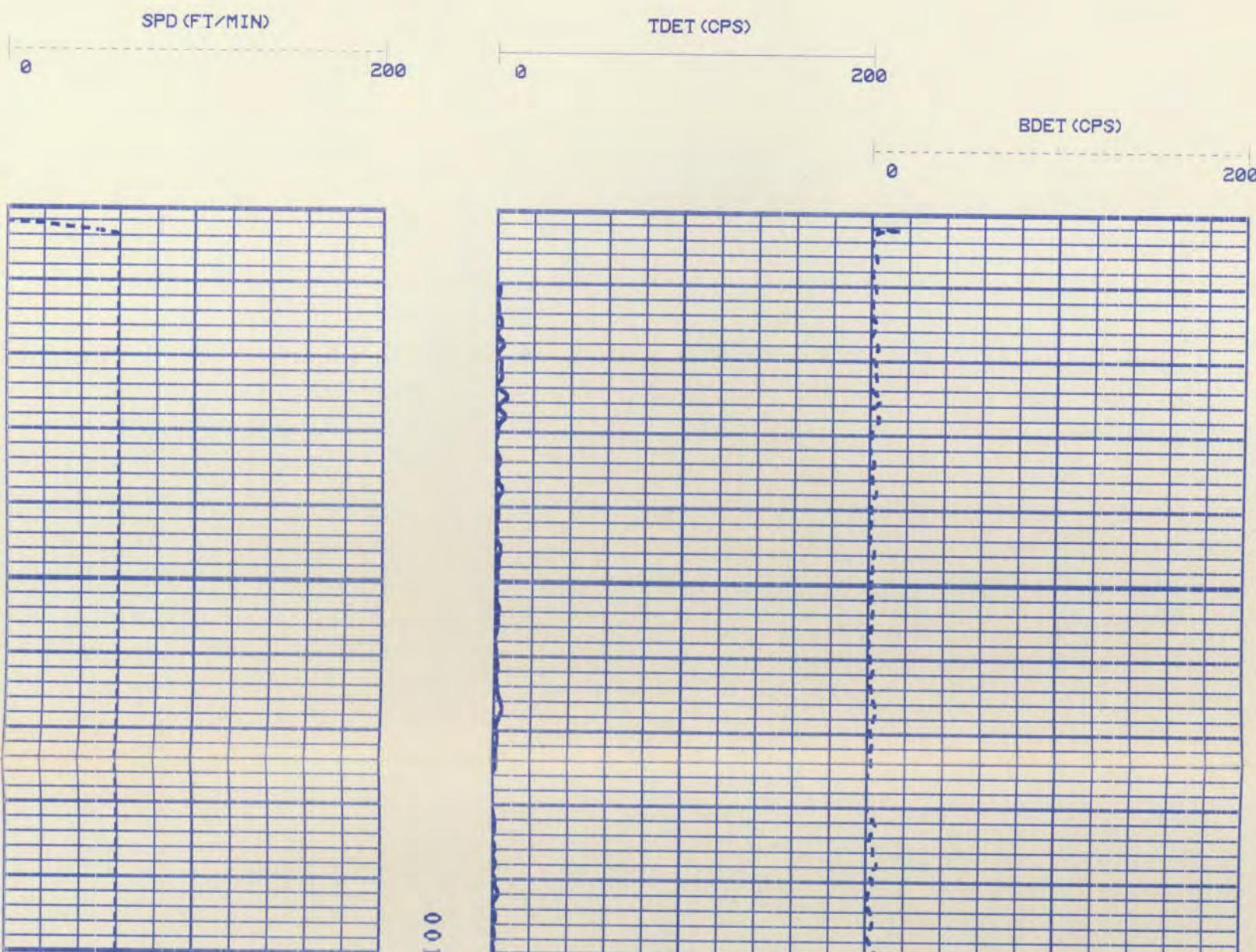
TIME DRIVE FILES BELOW

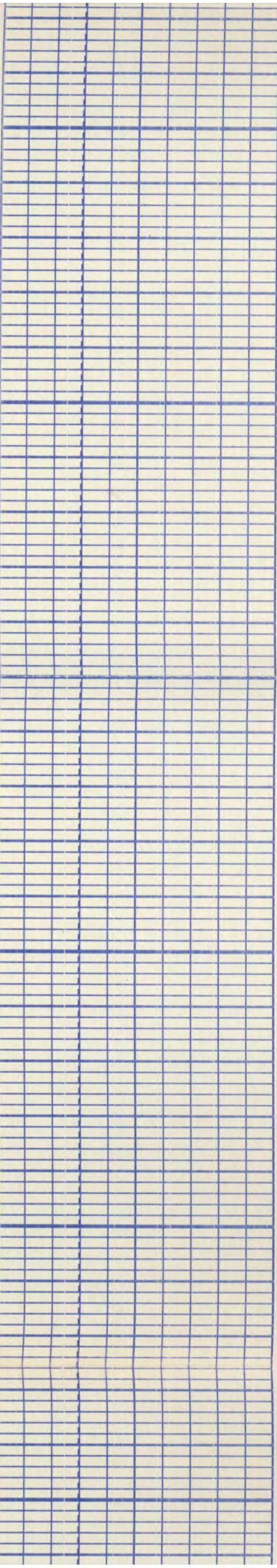
ON ALL SHOTS, SLUG IS SEEN
PASSING THE DET. BELOW THE
EJECTOR, (BDET)...BUT NO
RETURN ON THE UPPER. SEC.
ARE IN "FT." EJECTOR IS AT
3366, BDET AT 3370.

NOTE; WHENEVER PUMP IS SHUT
DOWN TO MOVE TANKS, DIFF.
PSI CAUSES A VERY SMALL
EJECTION FROM TOOL...SEEN
ONLY ON THE LOWER DET. NO SIGN
OF UPWARD MOVEMENT SEEN AT ALL,
AFTER 4 SLUGS FIRED. LAST 2
SLUGS WERE AT RATE OF 5 BPM,
FIRST 2 WERE AT 1 BPM.

REVISION: FSYS256 REV:G002 VER:2.0

MODE: RECORD

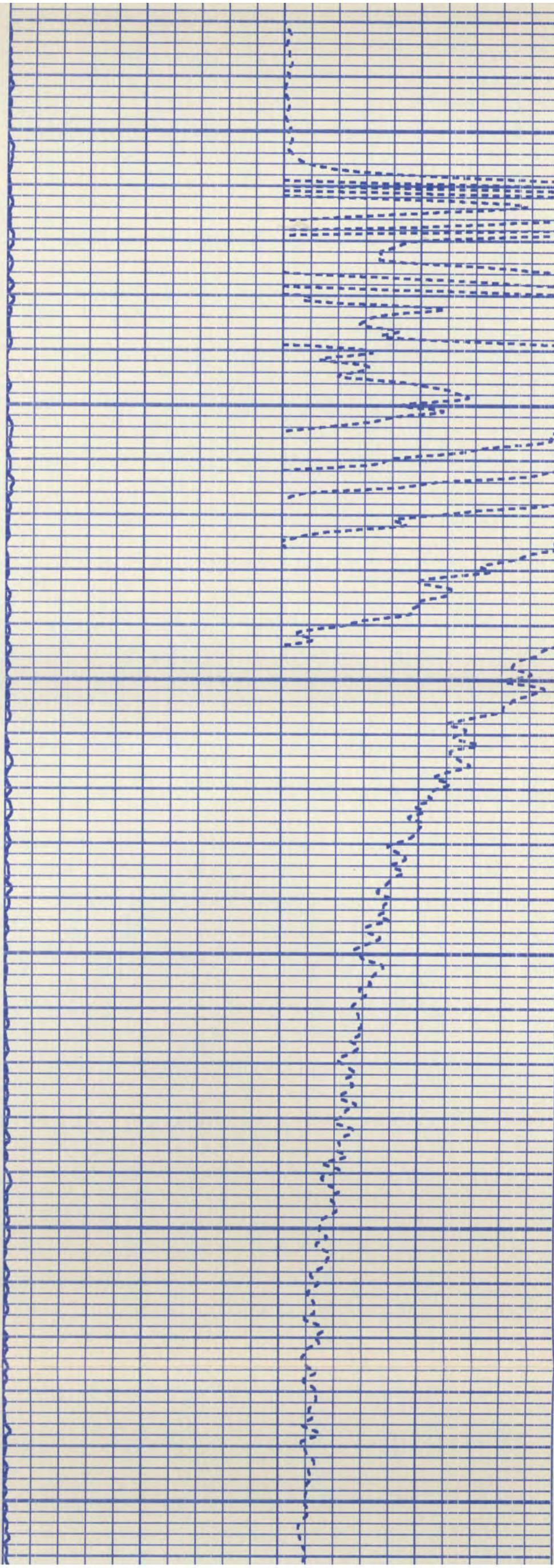


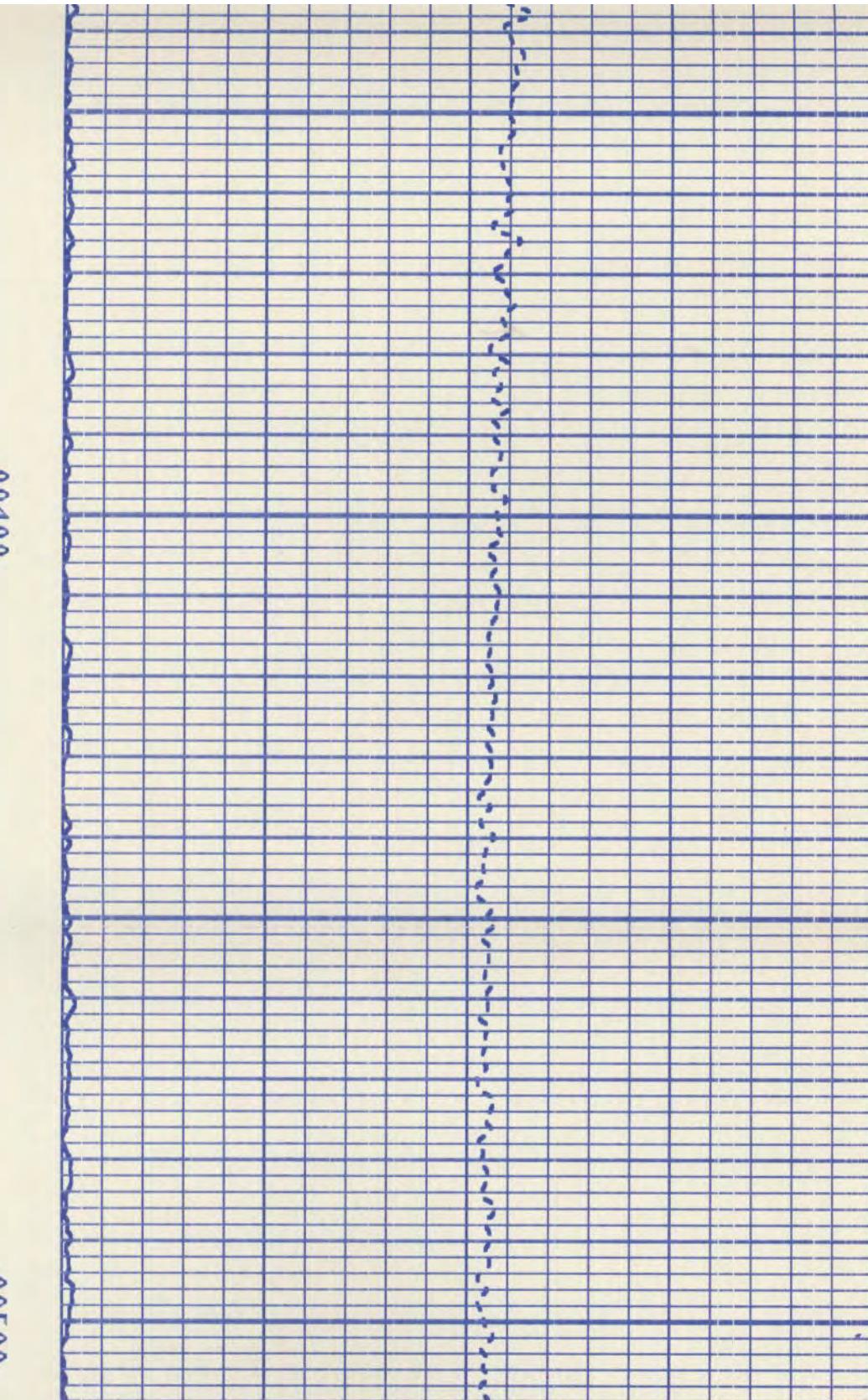


00100

00200

00300





REVISION: FSYS256 REV:G002 VER:2.0

MODE: RECORD

SPD (FT/MIN)

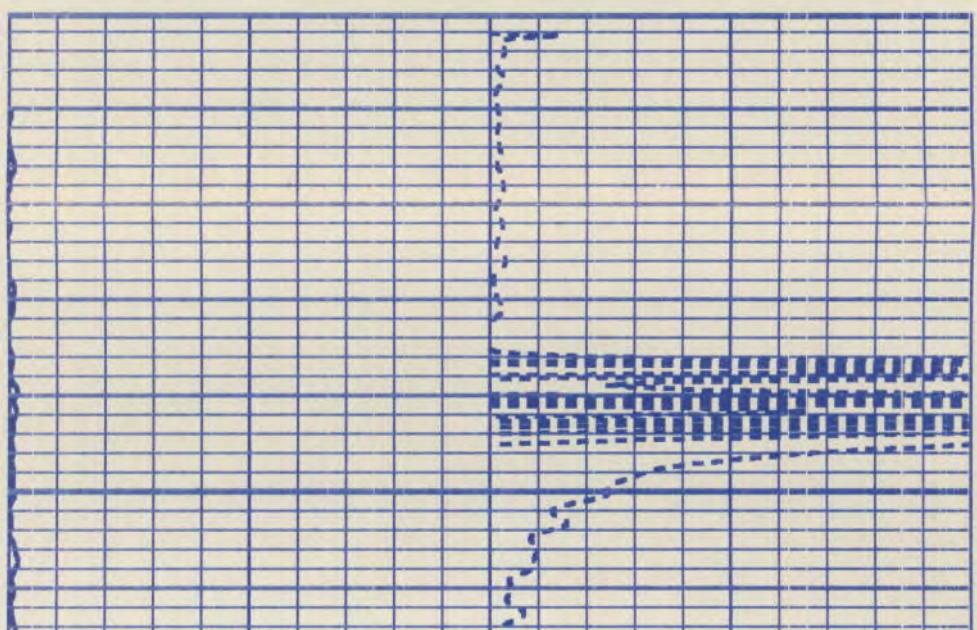
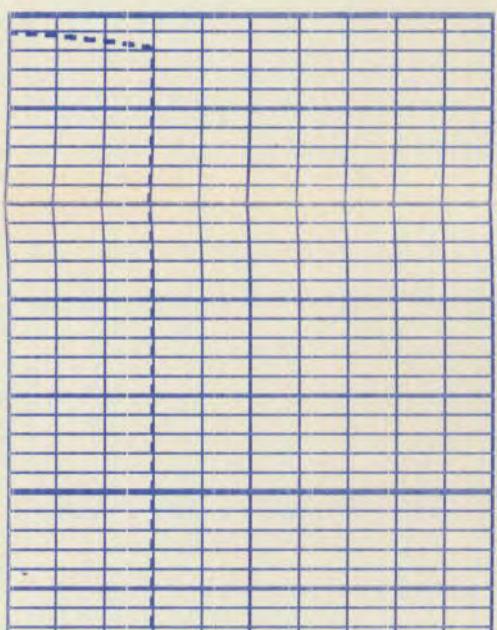
0 200

TDET (CPS)

0 200

BDET (CPS)

0 200



00100

00200

00300

00300

FILE: 7

RUN: 1

TRIP: 1

COMPANY:

WELL NAME:

SERVICE: F 150C FILE: 7

DATE: 01/20/93

TIME: 23:15:58

REVISION: FSYS256 REV:G002 VER:2.0

MODE: RECORD

DEPTH: 3381

SPD (FT/MIN)

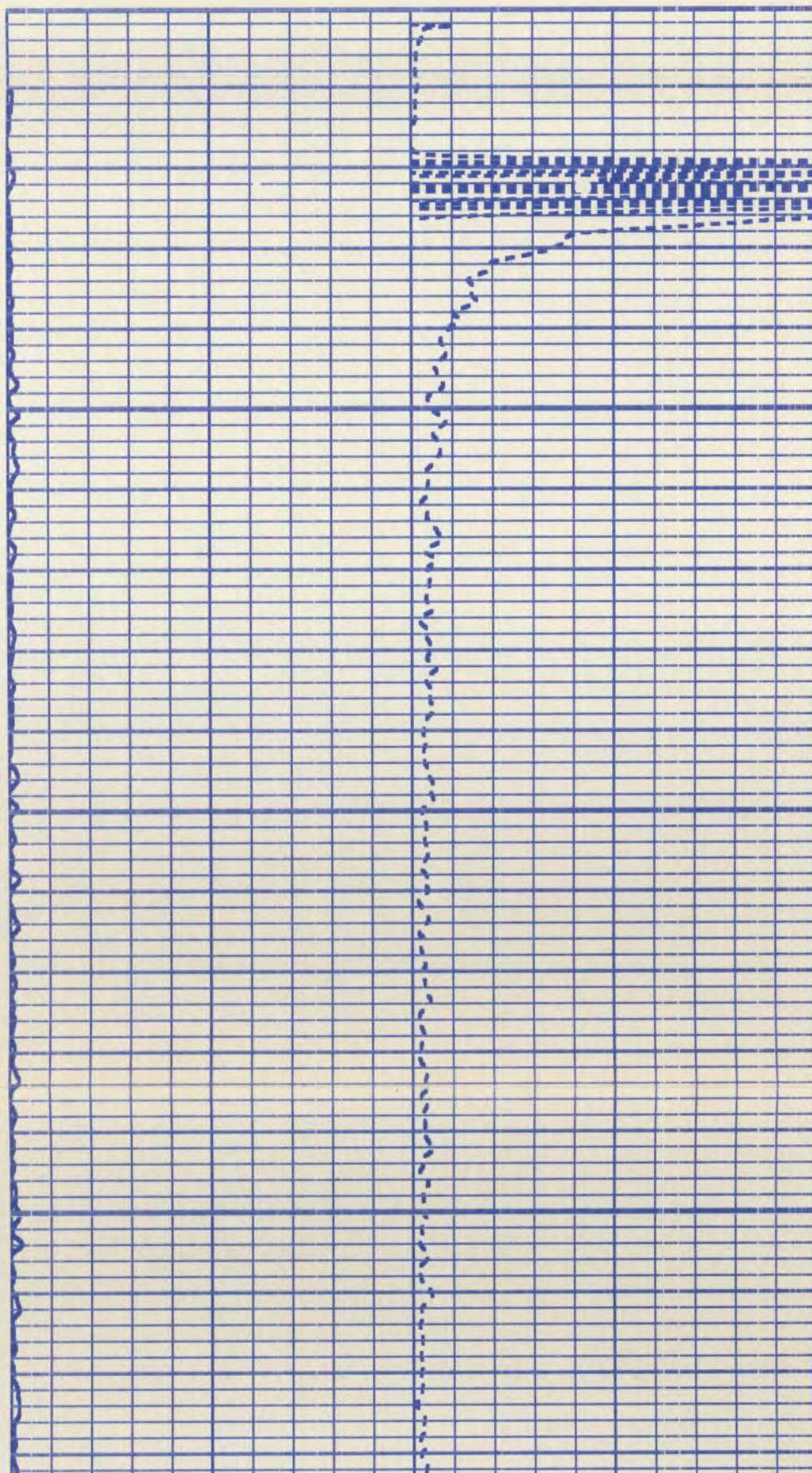
TDET (CPS)

0 200

0 200

BDET (CPS)

0 200



PUMP SHUT DOWN / TANK CHANGE

00200

00300

00400

00700

00800

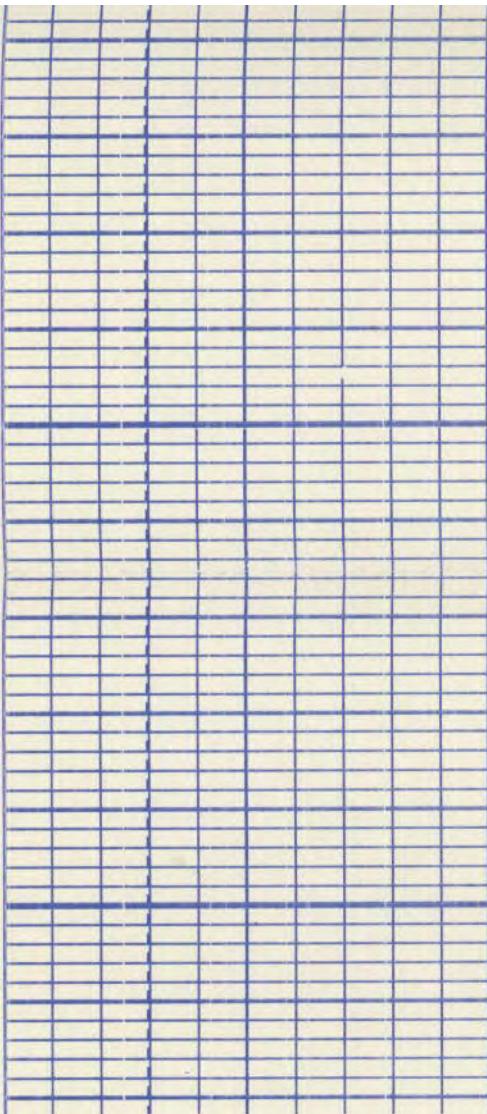
00900

01000

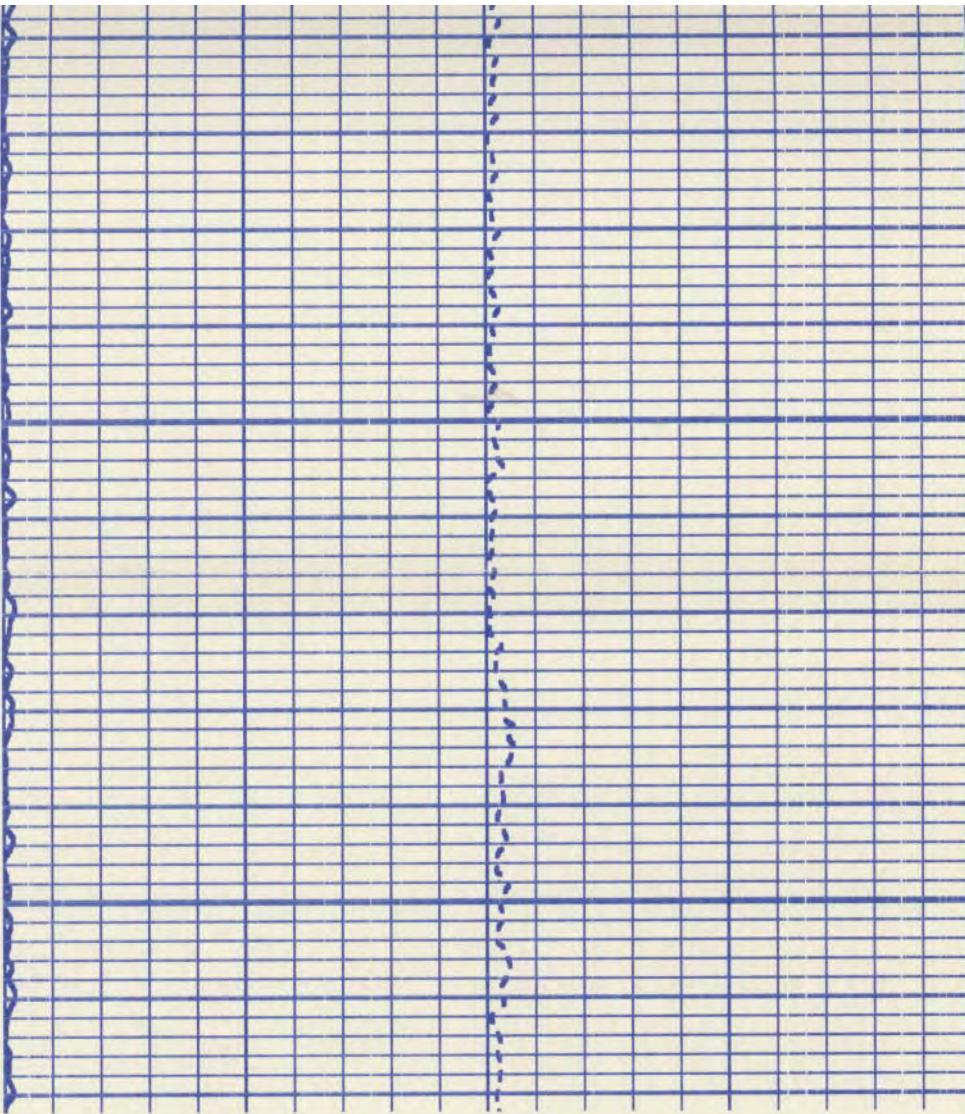
01100

01200

PUMP SHUT DOWN / TANK CHANGE



01300



*** NONE ***

COMPANY:

RUN: 1

WELL NAME:

TRIP: 1

SERVICE: F 150C FILE: 3

DATE: 01/20/93

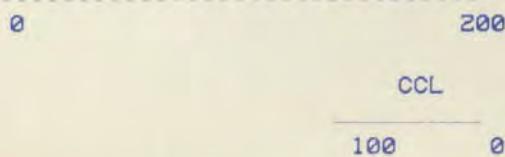
TIME: 22:28:25

REVISION: FSYS256 REV:G002 VER:2.0

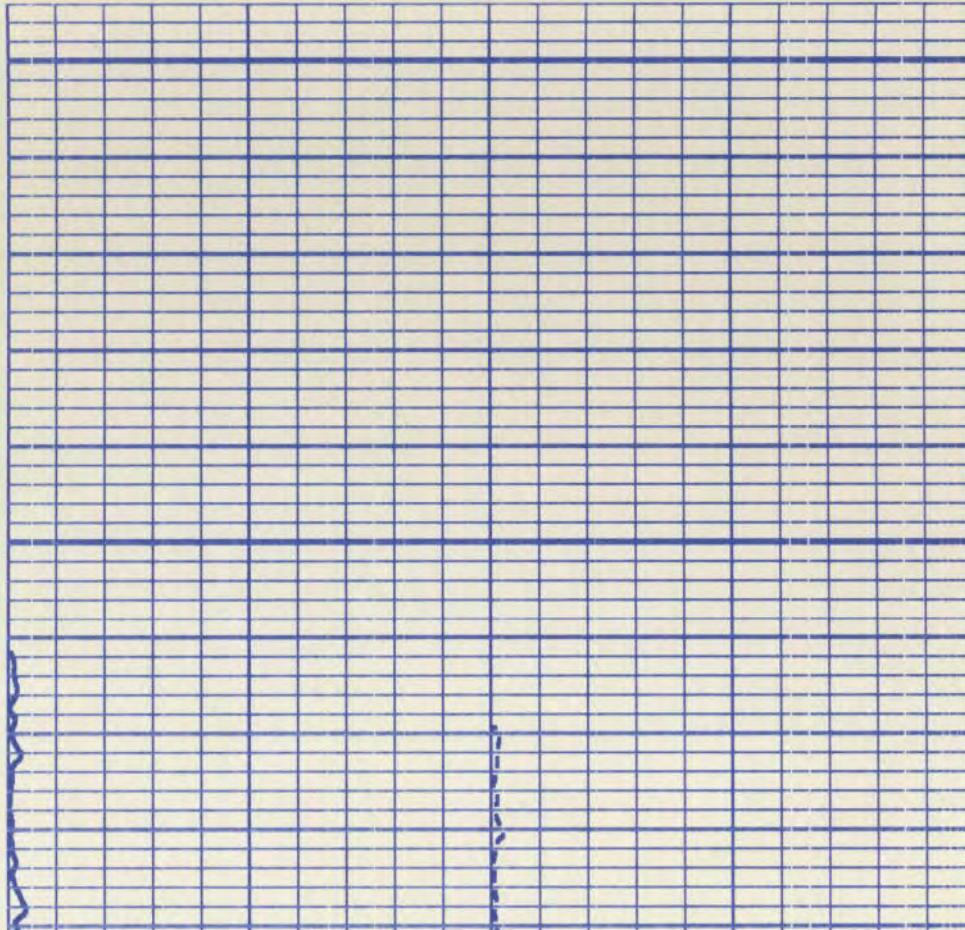
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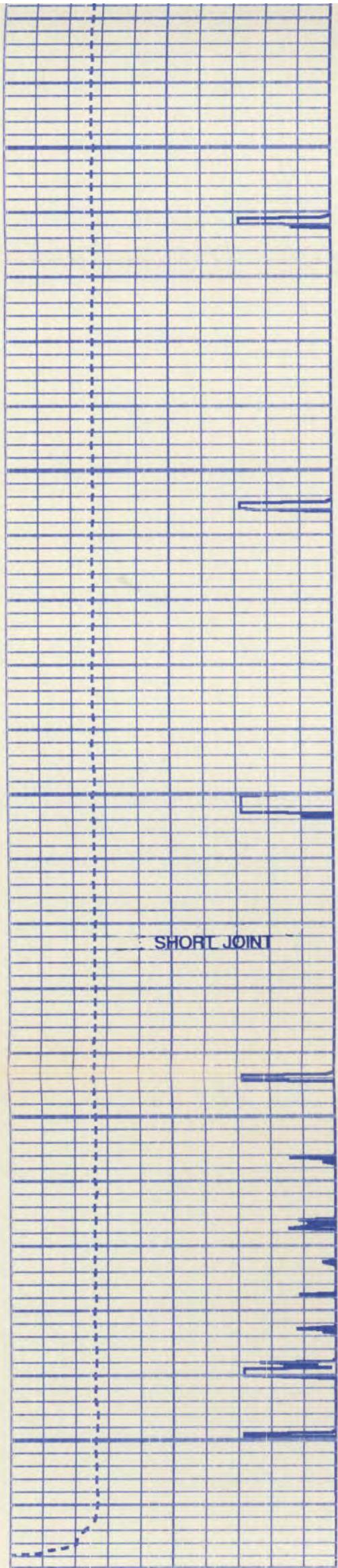
SPD (FT/MIN)

BDET (CPS)



03500

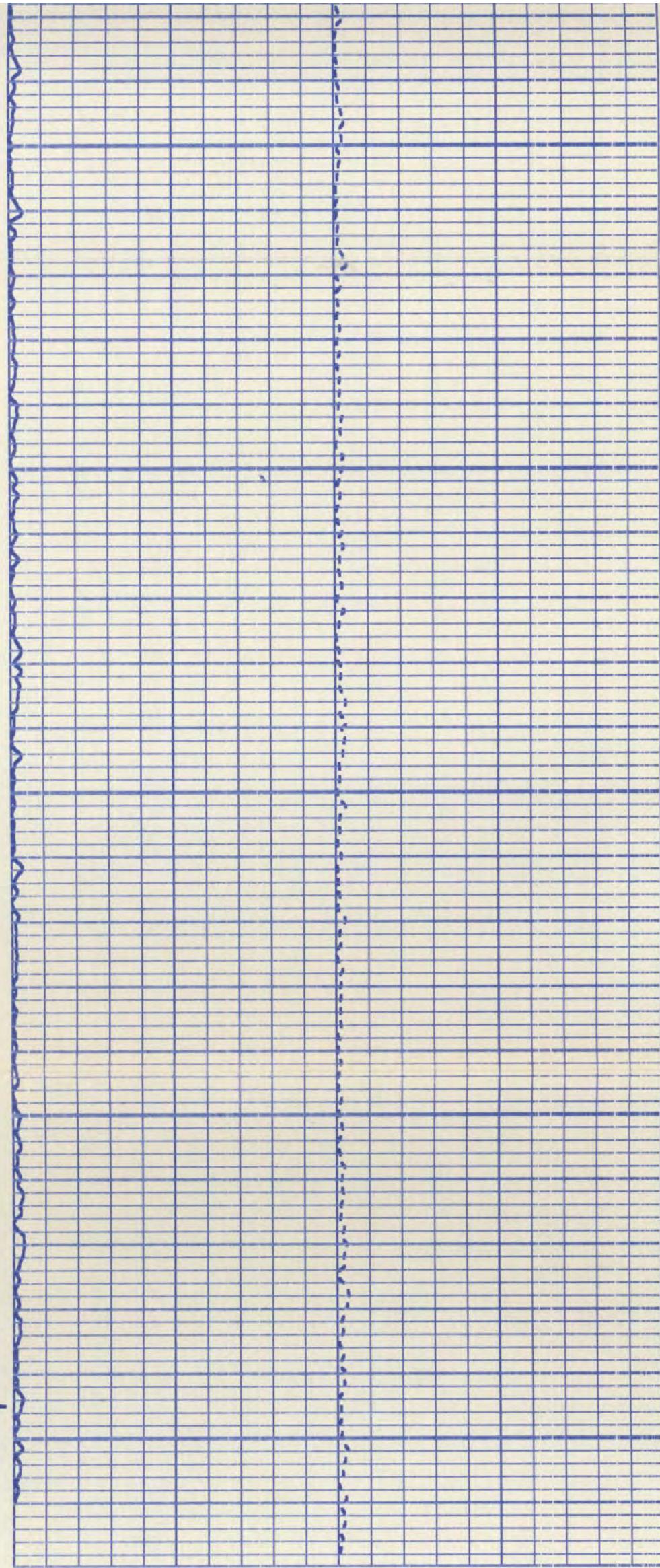




SPD (FT/MIN)

0 200

CCL



BDET (CPS)

0 200

TDET (CPS)

100 0

FILE: 3

FILE: 3

TIE-IN SECTION ABOVE ON
DEPTH; NOTE THE SHORT JOINT
(SECOND ONE ABOVE BOTTOM)
FIRST PICK-UP AT 3798, SEE
FIRST CCL KICK AT 3798.

DIAGNOSTIC PRODUCTION LOG ANALYSIS

Hoechst Celanese Corporation
Waste Disposal Well No. 1-A
Bay City Plant
Matagorda County, Texas

Prepared for
Bob Hall

Golden StrataServices, Inc.
Houston, Texas

ATLAS WIRELINE SERVICES
WESTERN ATLAS INTERNATIONAL

February 1993

Prepared by Freeman Hill, III

DISCLAIMER

In making interpretations of logs, our employees will give Customer the benefit of their best judgement, but since all interpretations are opinions based on inferences from electrical or other measurements, we cannot, and we do not guarantee the accuracy or the correctness of any interpretation. We shall not be liable or responsible for any loss, cost, damages, or expenses whatsoever incurred or sustained by the Customer resulting from any interpretation made/by any of our employees.



ATLAS WIRELINE SERVICES

Logging Program and Analysis (Cont.)

Date: 1/21/93 - Perforating

Perforating Targeted Area for Disposal

Gun Type: 5" Omnikone (Expendable Hollow Carrier)

Shots Per Foot: 5

Depths Perforated: 3376 feet to 3426 feet
 3460 feet to 3471 feet
 3494 feet to 3524 feet
 3543 feet to 3572 feet

Date: 1/22/93 - Pressure and Temperature Logs

1. Logged stationary pressure and temperature.

Purpose: Base-line static pressure and temperature.

Analysis: Pressure instrument at 3,440 feet. Pressure measured for somewhat over fifteen (15) minutes. Temperature varied by seven (7) degrees. Maximum P.S.I.A. recorded = 1592.94. Pressure gradient (.463).

2. Logged gamma ray detectors and collar locator.

Purpose: Establish Base-line for detectors and to obtain correlation.

Analysis: Readings within tolerances and detectors seem very stable.

3. Logged Stationary Radioactive Tracerlog. Tracerlog stationed at 3,366 feet. This would put the bottom detector at 3,370 feet; 6 feet above the upper perforation interval.

Purpose: Establish that a channel or communication is not present above the perforated intervals.

Analysis: One note, of no consequence, is that every time the pumps are shut down to change the tanks, a small amount of isotope is seen leaving the ejector. This can be seen on the bottom detectors (BDET) and is noted on the log. This is due to a sudden decrease in pressure around the tool which causes a slight leak before the tool can respond to the pressure drop. Four slugs were released by the tool. The first two were done with a surface injection rate of 42 GPM. The last two slugs were emitted with a surface injection rate of 210 GPM. The top detector (TDET) never indicated any radiation material moving into its area. The bottom detector (BDET) only indicated initial slug releases and did not indicate the return of radioactive material. There is no indication of upward movement.

APPENDIX L

SPINNER SURVEY AND WESTERN ATLAS' LOG
INTERPRETATION





ATLAS WIRELINE SERVICES

PRODUCTION LOGGING SERVICES

FILE NO.		
93015	COMPANY	CELANESE BAY CITY PLANT
API NO.	WELL	DISPOSAL WELL 1-A
FIELD	CELANESE PLANT	
COUNTY	STATE	TEXAS

IN MAKING INTERPRETATIONS OF LOGS OUR EMPLOYEES WILL GIVE CUSTOMER THE BENEFIT OF THEIR BEST JUDGEMENT, BUT SINCE ALL INTERPRETATIONS ARE OPINIONS BASED ON INFERENCES FROM ELECTRICAL OR OTHER MEASUREMENTS, WE CANNOT, AND WE DO NOT GUARANTEE THE ACCURACY OR CORRECTNESS OF ANY INTERPRETATION. WE SHALL NOT BE LIABLE OR RESPONSIBLE FOR ANY LOSS, COST, DAMAGES, OR EXPENSES WHATSOEVER INCURRED OR SUSTAINED BY THE CUSTOMER RESULTING FROM ANY INTERPRETATION MADE BY ANY OF OUR EMPLOYEES.

FINAL PRINT

COMPANY	CELANESI BAY CITY PLANT	
WELL	DISPOSAL WELL 1-A	
FIELD	CELANESE PLANT	
COUNTY	MATAGORDA	STATE
LOCATION:	TEXAS	
N/A		
	OTHER SERVICES	

FOLD HERE

SIZE WGT FROM TO
9 5/8 40/43 SURF 5938

CASE RECORD

REMARKS RUN (1)

AFTER STABILIZING INJECTION RATE AT 200 GPM,
FLOWMETER, TEMP., & HP. PRESSURE WERE RUN.

WHILE ALL HP DEPTHS ARE REFERENCED TO GL, THE LOGGING DEPTHS ARE REF. TO ORIGINAL DF, A DIFF. OF 17 FT. DUE TO POS. FILL, TOOL WAS POSITIONED AT 3360 (DF MEAS.) FOR FALL-OFF. HP. SENSOR DEPTH WAS 3334 (REF. GROUND LEVEL). P.S.I., AFTER 16 HRS. FALL OFF WAS 1541.2 P.S.I.

COMMENTS ON LOGS BELOW

COMMENTS ON LOGS BELOW

ON FIRST DOWN PASS WITH SPINNER, WE FOUND BOTTOM AT 3572, + OR - 8 FT. PICK-UP IS UNCERTAIN (SOFT BOTTOM). AFTER CLEANING CLAY FROM FLOWMETER WE AVOIDED THE LOWER PERFS.

FLOWMETER CALCULATIONS

3376-3426, 170 GPM

3460-3471, 12

3494-3524, 4

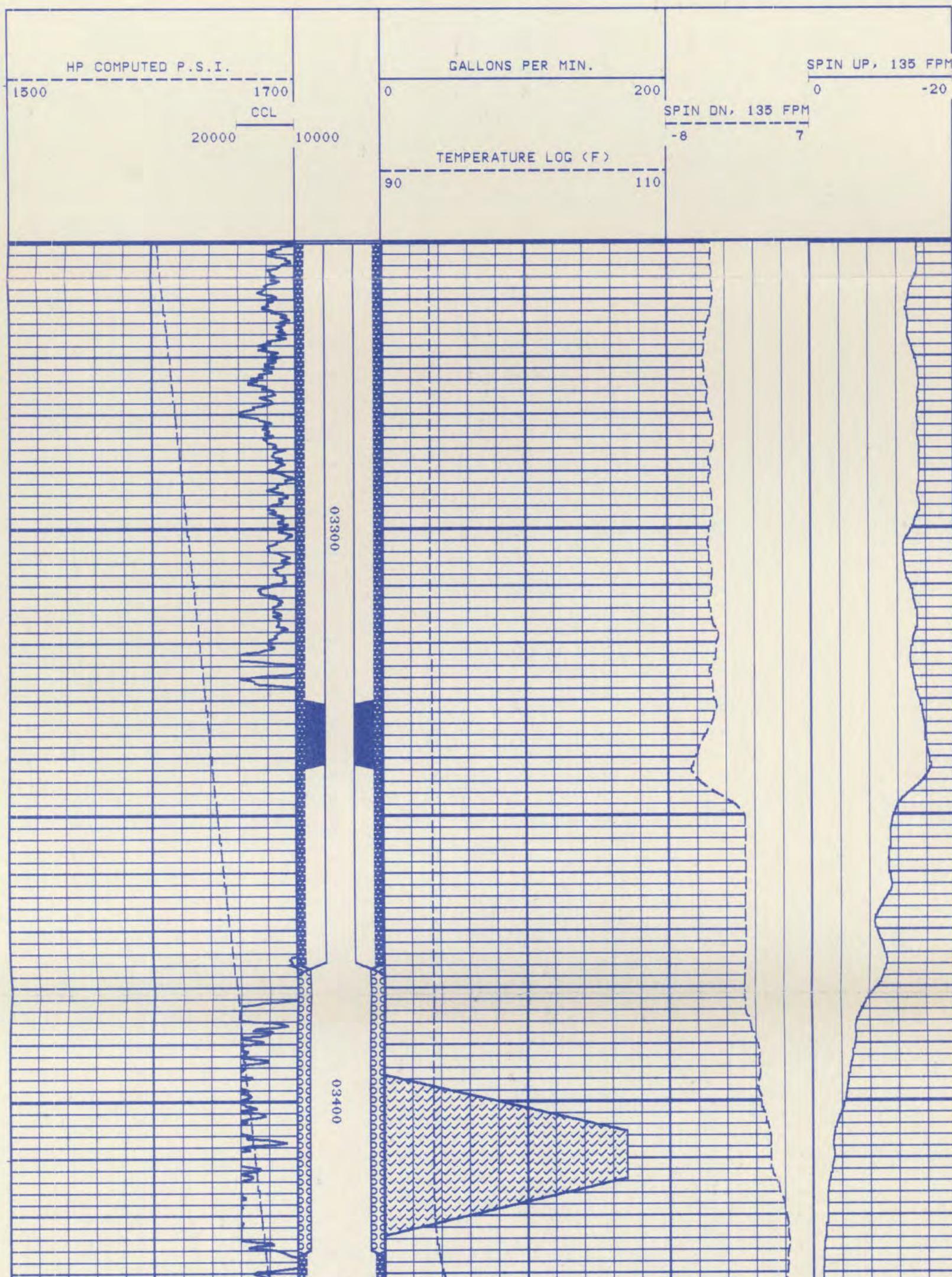
3543-3572, 14

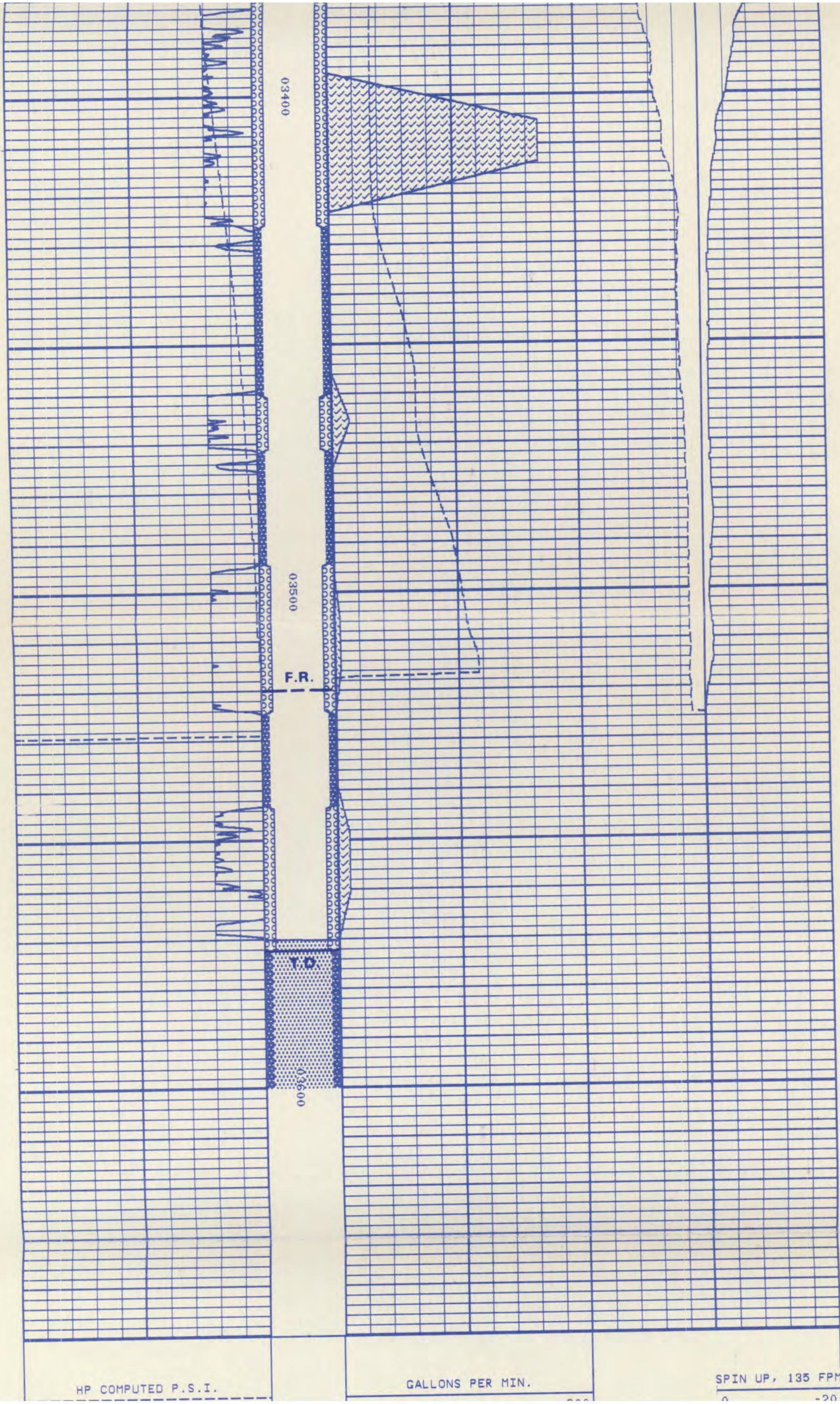
NOTE; HORNER & TYPE CURVE PLOTS WERE ALSO COMPLETED ON LOCATION

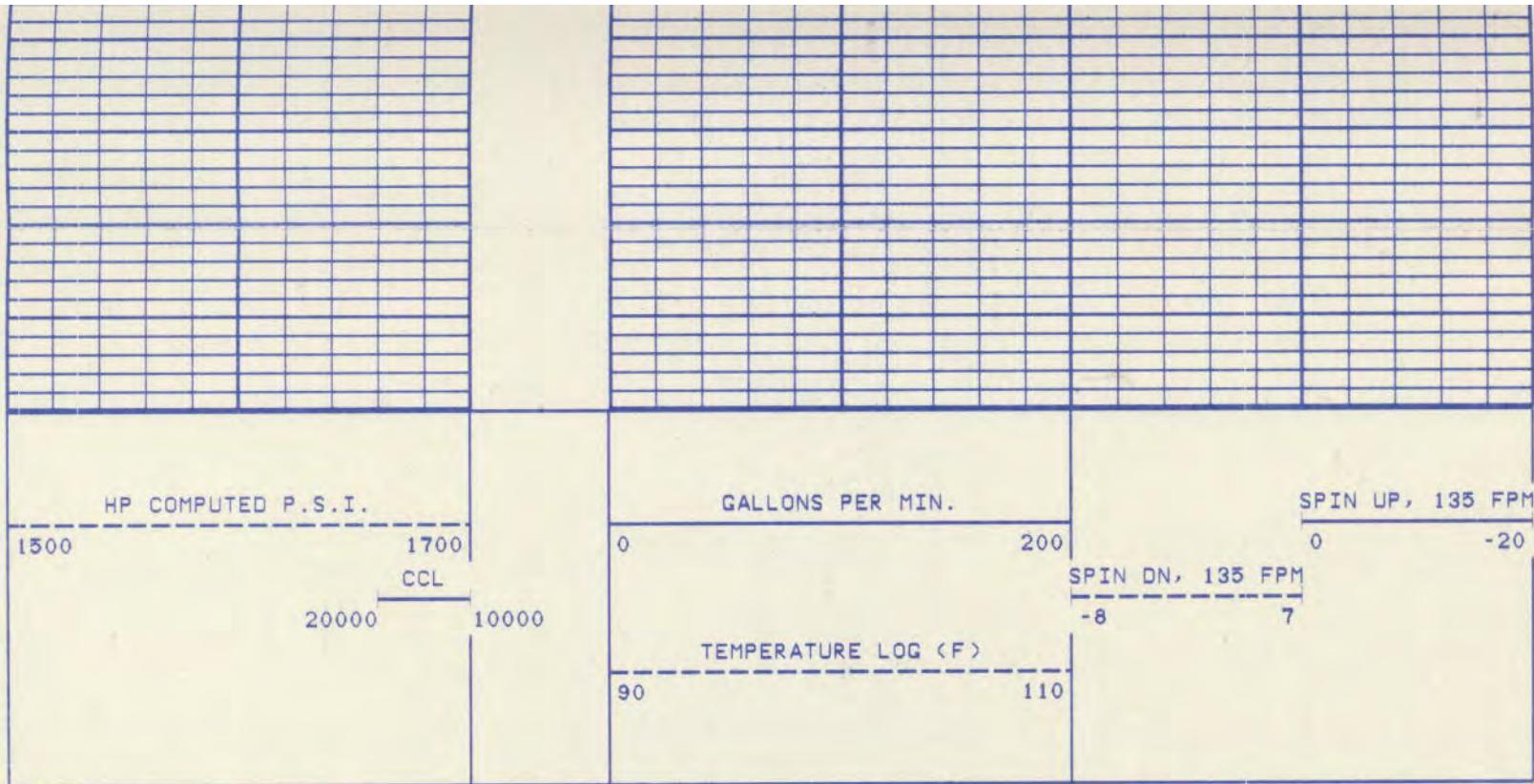
HP. PRESSURE VALUES, WELL SHUT-IN 18 HOURS.

DEPTH	P.S.I.
0	93
500	304.21
1000	523.45
1500	741.72
2000	959.11
2500	1171.14
3000	1387.56

READINGS ABOVE ARE REF. TO GROUND LEVEL, STABIL. 4 MINUTES AT EA. STOP.







*** CALIBRATIONS BELOW ***

```
*****
*   CALIBRATION/VERIFICATION SUMMARIES   *
*   DATE 02/17/93           TIME 13:05:02  *
*   RUN 1                  TRIP 1        *
*   ****
*****
```

*** GR NOT CALIBRATED ***

LOG NAME HP ASSET NO. 0001 UNIT NO. SHOP CAL
CALIBRATION ENTERED ON 02/16/93 AT 08:35:21

TEMPERATURE COEFFICIENTS

DATE 02/15/93	CALIBRATION	TIME 13:44:39	
G0	H0	I0	J0
5.67607E 05	1.05659E 02	-2.97454E-04	4.43237E-09
G1	H1	I1	J1
1.17530E 00	-2.51190E-03	1.22594E-06	-6.75704E-11
G2	H2	I2	J2
8.11190E-03	2.77126E-05	-6.14214E-09	3.41897E-13
G3	H3	I3	J3
1.69716E-05	-1.09611E-07	1.04629E-11	-5.51081E-16
G4	H4	I4	J4
-3.60792E-11	-7.29141E-15	7.51928E-19	-4.64593E-23

MUD PRESSURE CORRECTION
0.0000 PSI

DIAGNOSTIC PRODUCTION LOG ANALYSIS

Hoechst Celanese Corporation
Waste Disposal Well No. 1-A
Bay City Plant
Matagorda County, Texas

Prepared for
Bob Hall

Golden StrataServices, Inc.
Houston, Texas

ATLAS WIRELINE SERVICES
WESTERN ATLAS INTERNATIONAL

February 1993

Prepared by Freeman Hill, III

DISCLAIMER

In making interpretations of logs, our employees will give Customer the benefit of their best judgement, but since all interpretations are opinions based on inferences from electrical or other measurements, we cannot, and we do not guarantee the accuracy or the correctness of any interpretation. We shall not be liable or responsible for any loss, cost, damages, or expenses whatsoever incurred or sustained by the Customer resulting from any interpretation made/by any of our employees.

Logging Program and Analysis (Cont.)

Date: 2/17/93 - Continuous Spinner / Temperature / Pressure Logs

1. Continuous Spinner Log, Temperature Log and Fall-off Test. (HP Pressure Gauge).

Note: Pressure information and analyst not in this document.

Purpose: Determine injection profiles of zones.

Analysis: Bottom found to be at 3,572 feet. Unfortunately, the bottom was soft leaving material on the spinner leaving it non-functional. We then went in the hole again skipping the lower set of perforation.

The injection was interpreted as being distributed in the following manner:

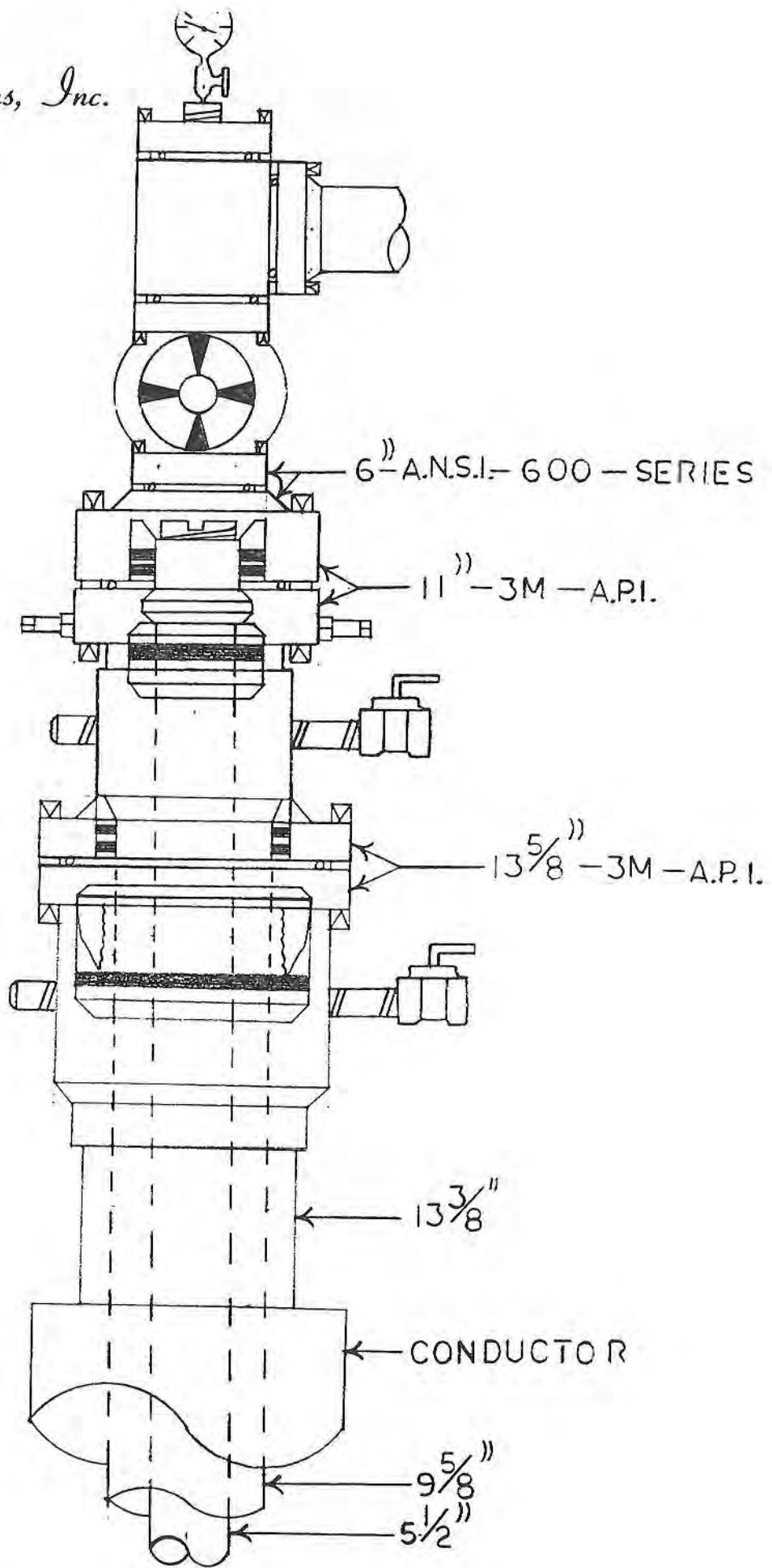
Perforation Set	% Of Injection	GPM Injected
3376 - 3426 feet	85	170
3460 - 3471 feet	6	12
3494 - 3524 feet	2	4
3543 - 3572 feet	7	14
	100 %	200 GPM

The temperature log corresponds with the spinner, in that the bottom of the top perforated interval is taking the majority of the fluid.

APPENDIX M
WELLHEAD SCHEMATIC



Wellhead Productions, Inc.



APPENDIX N
HALLIBURTON CORROSION INHIBITOR DATA



HALLIBURTON SERVICES
Chemical Services

CONFIDENTIAL FIELD BULLETIN NO. 3-9
(Employees Only)

ANHIB
Packer Fluid Corrosion Inhibitor

Introduction

ANHIB is a corrosion inhibitor which is designed for use in aqueous fluids for placement in the annular space between tubing and casing or behind casing.

In the past, we have recommended sodium chromate as an inhibitor for aqueous packer fluids. This treatment consisted of 500 to 2000 ppm sodium chromate with the pH adjusted to 10 or higher with sodium hydroxide and this is still a good recommendation. A bactericide such as Adomall is also required. ANHIB is a multi component system in a single drum which can be used in place of sodium chromate. It is effective against oxygen, hydrogen sulfide and carbon dioxide corrosion. No pH adjustment is required with this inhibitor; therefore, it should be easier to use than sodium chromate. In addition, ANHIB is an organic corrosion inhibitor which will not be as adversely affected by hydrogen sulfide as the chromate system if contamination occurs. This material is also an effective bactericide for sulfate reducing bacteria when used in the recommended concentration range. The normal recommended dosage for this inhibitor is 5 gallons per 100 bbls. (approximately 1200 ppm) or 1 gallon per 1000 gallon.

Materials Used In Process

ANHIB (Part No. 70.15341) is a red colored liquid with the following physical properties:

Flash Point	81° F. T.O.C./67° F. T.C.C.
Pour Point	(-) 20° F.
Specific Gravity @ 60° F.	1.07
Density @ 60° F.	8.9 lbs/gal.
Color	Red
Odor	Pungent, alcoholic
pH 10% solution in distilled water	8.4
Viscosity	64 cps @ 60° F.
Stability	Greater than 6 months but should be used as soon as possible.

NOTE: An open can will degrade eventually so it is recommended that you use all of the 5 gallon can. Carefully replace the bung in a 55 gallon drum. The bung should be tight to prevent additional air from entering the drum.

Mixing Procedure

ANHIB is readily soluble in most brines so should present no mixing problems; however, it is an effective oxygen scavenger and will pick up oxygen from the air. It should be added with a minimum of agitation. Hoses should be introduced below fluid level to minimize beating in additional air. Waiting time before pumping should also be kept to a minimum.

You may want to meter the material into the packer fluid at the pump suction as a concentrate. The hydrazine pump should be satisfactory for this purpose.

Use Concentration

ANHIB can be used at a concentration as low as 500 ppm (½ gal/1000 gallons); however, the standard recommendation is 5 gallons in 100 bbls. At temperatures above about 200° F. the use concentration should be 10 gal/100 bbls.

The material contains a red dye. This dye can be seen at a concentration of 200 ppm in tap water.

Toxicity and Safety

ANHIB should be handled in accordance with the following precautions:

- (1) Avoid contact with eyes, skin and clothing.
- (2) Avoid breathing mist or vapor.
- (3) Do not take internally.

In case of contact with eyes or skin, immediately flush with water for 15 minutes; for eyes get medical attention. Remove contaminated clothing and shoes at once. Wash thoroughly before re-use.

ANHIB contains a reducing agent and should not be stored near oxidizing agents.

Anhib (Continued)

Corrosion Data

Table I
Static CO₂ Corrosion Tests

Type:	Pressure bottle
Fluid:	Tap Water*
Temperature:	72°F.
Acid Gas:	CO ₂ @ 15 psig
Time:	7 days
Coupons:	AISI 1020 carbon steel

ANHIB Concentration ppm	Corrosion Rate MPY	% Protection
0 (blank)	11.3	0
5	0.8	93

*Contains a trace of oxygen when saturated with CO₂

Table II
Instantaneous Corrosion Tests With Oxygen

Corrosive Fluid: Sea water saturated with air
Temperature: 70°F.

Corrosion in Mills per Year

Time	No Inhibitor	ANHIB @ 1000 ppm
Initial	21	6.6
3 hours	36	5.5
1 day	7	2.0
2 days	4	1.2

Table III
Dynamic H₂S Corrosion Tests

Type: Wheel Test
Corrosive Fluid: 5% NaCl saturated with H₂S
Time: 1 day
Temperature: 100°F.

ANHIB Concentration	% Protection
20 ppm	93
50 ppm	93

Table IV
Dynamic CO₂ Corrosion Test

Type:	Wheel Test
Corrosive Fluid:	5% NaCl Brine saturated with CO ₂
Time:	1 day
Temperature:	100° F.
ANHIB Concentration	% Protection
50 ppm	59
500 ppm	89

Table V
High Temperature Corrosion Test

Type:	Pressure bottle
Corrodent:	Oxygen saturated brine*
pH:	9 to 9.5
Temperature:	300° F.
Time:	5 days
ANHIB Concentration	% Protection
2000 ppm	72
5000 ppm	76

*Brine contains 2% KCl adjusted to 10.2 lbs/gal. with CaCl₂. It was air saturated at room temperature then heated in a closed system.

Properties:

ANHIB is a combination chemical which provides the following functions

Oxygen Scavenger - Requires a minimum concentration of 500 ppm ($\frac{1}{2}$ gal/1000 gal) to completely remove all oxygen from air-saturated water.

Bactericide - is an excellent bactericide for sulfate-reducing bacteria and will provide protection at 40 ppm; however, for quick kill 500 ppm ($\frac{1}{2}$ gal/1000 gallons) is recommended.

Corrosion Inhibition - decreases corrosion by oxygen by removing the oxygen. Minimizes corrosion by CO₂ and H₂S. See Tables 1, 2, 3, 4 and 5.

Surface Tension Reduction - surface tension of sea water containing 1000 ppm is 40.5 dyne/cm.

Compatibility - ANHIB is compatible with Halliburton's cross linked gels which may be used as annular, packer or completion fluids.

Stability - ANHIB is stable up to 300° F. in brine solutions.

Precautions

1. ANHIB is soluble in fresh water and all concentrations of sodium chloride brine. However, it will precipitate from calcium containing brines if the calcium content exceeds 40,000 ppm.

If saturated calcium chloride brine needs to be inhibited, the inhibitor will provide protection but a small amount of precipitate will be observed and oxygen will be removed more slowly than from brines with only a small amount of calcium.

2. ANHIB is an effective oxygen scavenger so it should be added to the packer fluid just prior to the time it is pumped into the well and with a minimum of agitation. Beating additional air into the system, and allowing it to set open to the air for a period of time before it is pumped may completely deplete the oxygen scavenger and result in little or no protection from oxygen conventional scavengers; but, pump it as soon as possible.

Metering the ANHIB into the suction of the pump while displacing the packer fluid would probably be the preferred mixing procedure.

3. The pH of a solution of 5 gallons of ANHIB in 100 bbls. of fresh water is about 7. It is satisfactory to adjust the pH to a higher level if desired.

If the pH of a concentrated calcium chloride solution is adjusted above about 9, there will probably be some precipitate of free lime observed.

Special Application

Gelled fluids are sometimes placed behind an intermediate string of pipe instead of cement to allow recovery of that string when the well was completed and the long string cemented into place. A number of different techniques have been used, one of which is described in the attached article, "Unorthodox Completion Salvages Protection String".

Although the gelled fluid may only be in place behind the intermediate string for a short period of time (a few days or weeks), it will remain behind the long string for as long as the well is produced. Consequently, the gelled fluid needs to be inhibited as badly as any packer fluid.

ANHIB was specifically designed to be compatible with Kleer-Gel and the cross linked gels which might be used as annular fluids. Most corrosion inhibitors are not compatible with the cross-linked gels.

The Fracturing Section has developed a special gel which is slightly basic and very stable which should be more satisfactory than Kleer-Gel as an annular fluid. Kleer-Gel has a fairly low pH and will be more corrosive than the new gel.

The comment has been made that the intermediate string wears out after being used 8 or 10 times. Some of this damage is undoubtedly due to drilling inside it for a long period of time. Corrosion on the outside from an acidic fluid which contains oxygen will also contribute to its deterioration. The use of a high pH, low corrosivity gel plus an effective corrosion inhibitor which also removes oxygen and acts as a bactericide should aid in providing maximum protection to the pipe plus increasing its useful life.

Instructions for preparing the annular gel can be obtained from John Burnham in the Fracturing Section.

APPENDIX O
REGULATORY NOTIFICATION

February 5, 1993
KW-023-93

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

Mr. Richard Merritt, Geologist
Underground Injection Control Section
Texas Water Commission
1700 North Congress Avenue
Austin, Texas 77811-3087

Subject: Acidizing Injection Well WDW-110 (1-A)
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas
Facility Registration Number 30134

Dear Mr. Merritt:

Per our telephone conversation, below please find the job procedures for acidizing injection well WDW-110 at Hoechst Celanese Chemical Group, Inc., Bay City Plant, Bay City, Texas. The procedures are as follows:

1. Pump 4,000 gallons of 15% FE Acid.
2. Pump 1,000 gallons of 15% FE Acid and 50 gallons of matriseal OWG (diverter).
3. Pump 3,000 gallons of 15% FE Acid.
4. Pump 1,000 gallons of 15% FE Acid and 50 gallons matriseal OWG (diverter).
5. Pump 4,000 gallons of 15% FE Acid.
6. Pump 1,000 gallons of 2% Cla-Fix water
7. Displace well with 500 barrels of number 10 brine.

If you have questions concerning this document, please telephone me at (409)241-4123 or Mr. I.O. Coleman, Jr.

Sincerely,

Kaymartha Williams
Kaymartha Williams
Environmental Engineer

Attachment

Hoechst Celanese

January 25, 1993
KW-024-93

Chemical Group
Bay City Plant
Hoechst Celanese Corporation
PO Box 509, FM 3057
Bay City, TX 77404-0509
409 245 4871

Mr. Richard Merritt, Geologist
Underground Injection Control Section
Texas Water Commission
1700 North Congress Avenue
Austin, Texas 77811-3087

Subject: Revised Packer Set Point for Injection Well WDW-110
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas
Facility Registration Number 30134

Dear Mr. Merritt:

Per your telephone conversation with Mr. I.O. Coleman, Jr., Environmental Section Leader, this letter will provide documentation to the Texas Water Commission well file that the bottom of the injection packer will be set at approximately 3,330 feet in lieu of 3,340 in injection well WDW-110.

Mechanical Integrity Testing, both the annulus pressure test and the radioactive tracer surveys are tentatively planned for the week of January 25, 1993.

If you have questions concerning this document, please telephone me at (409) 241-4123 or Mr. I.O. Coleman, Jr.

Sincerely,



Kaymartha Williams
Environmental Engineer

Attachment

cc: Mr. Ben Knape
Underground Injection Control Section
Texas Water Commission
1700 North Congress Avenue
Austin, Texas 77811-3087

Ms. Susan Bredehoest, Manager
Hazardous/Solid Waste Division
Texas Water Commission - District 7
5144 E. Sam Houston Parkway North
Houston, Texas 77015

Hoechst

February 4, 1993
KW-025-93

Chemical Group
Bay City Plant
Hoechst Celanese Corporation
PO Box 509, FM 3057
Bay City, TX 77404-0509
409 245 4871

Mr. Richard Merritt, Geologist
Underground Injection Control Section
Texas Water Commission
1700 North Congress Avenue
Austin, Texas 77811-3087

Subject: Acidizing Injection Well WDW-110 (1-A)
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas
Facility Registration Number 30134

Dear Mr. Merritt:

Per our telephone conversation, this letter will provide documentation to the Texas Water Commission well file that Hoechst Celanese Chemical Group, Inc. Bay City Plant, Bay City, Texas is scheduled to acidize injection well WDW-110 (1-A) on February 5, 1993.

If you have questions concerning this letter, please contact me at (409)241-4123 or Mr. I.O. Coleman, Jr. at (409)241-4197.

sincerely,



Kaymartha Williams
Environmental Engineer

Attachment

cc: Mr. Ben Knape
Underground Injection Control Section
Texas Water Commission
1700 North Congress Avenue
Austin, Texas 77811-3087

Ms. Susan Bredehoest, Manager
Hazardous/Solid Waste Division
Texas Water Commission - District 7
5144 E. Sam Houston Parkway North
Houston, Texas 77015

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City TX 77404-0509

January 14, 1993
IOC-008-93

Mr. Richard E. Merritt
Permit Coordinator
Underground Injection Control Team Permits Section
Office of Waste Management and Pollution Group
Texas Water Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087

Subject: Recompletion of Class I Injection Well, WDW-110
Schedule of Field Operation
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas

Dear Mr. Merritt:

As followup to our telephone conversation on today, this letter provides written notification that we will be completing the field operations associated with recompletion of WDW-110. Pending workover rig availability, field operations will begin the week of January 18th and last approximately one (1) week.

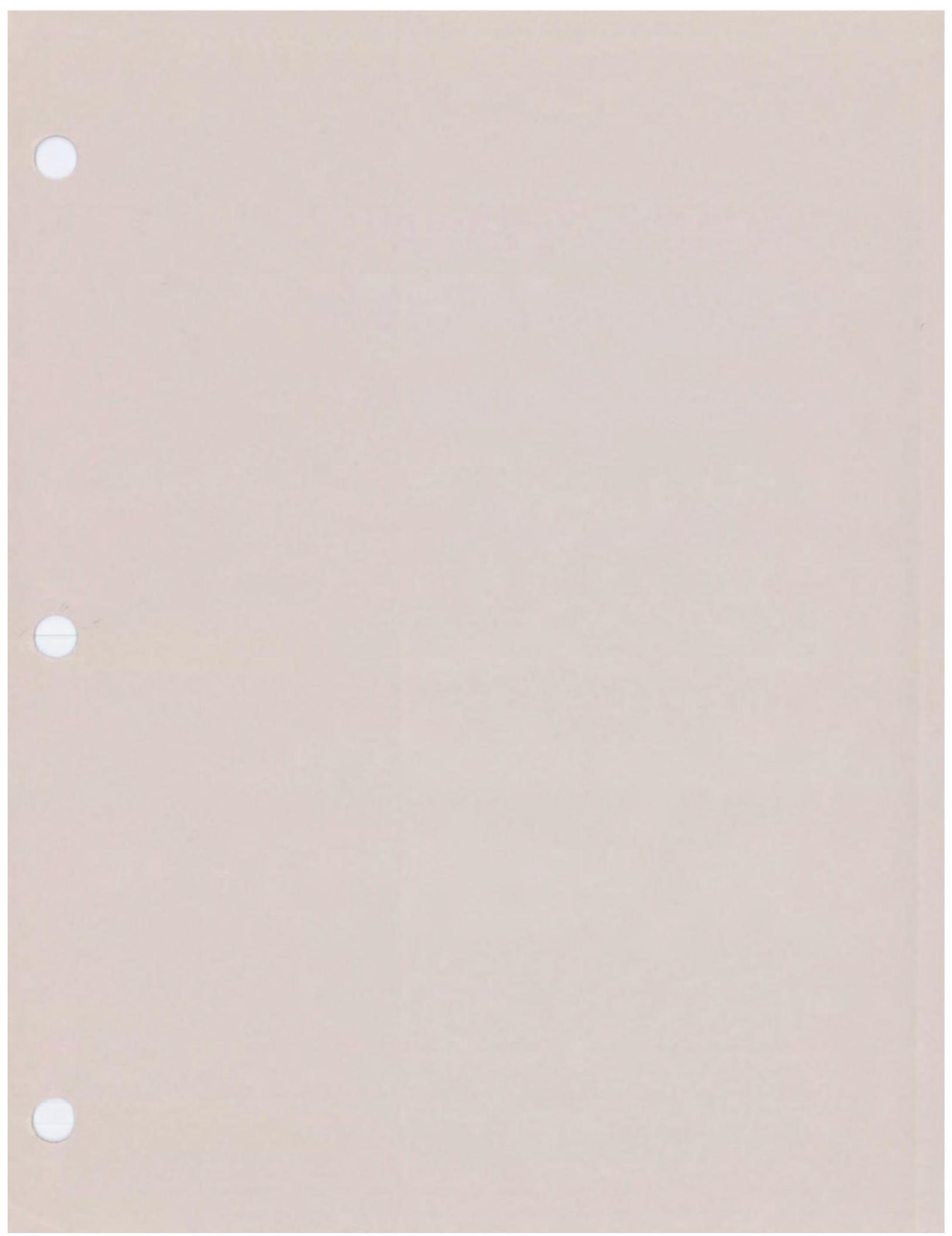
Mechanical integrity testing, including the annulus pressure test and the radioactive tracer surveys, is tentatively planned for the week of January 25th.

Please do not hesitate to contact me by telephone at (409) 241-4197 if you have any comments or questions concerning this matter.

Very truly yours,

I. O. Coleman, Jr.
I. O. Coleman, Jr.
Environmental Section Leader

cc: Mr. Ben K. Knape
Underground Injection Control Section
Texas Water Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087



Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

May 20, 1993
IOC-042-93

Mr. Mac A. Weaver, P. E.
Chief
UIC State Programs Section (6W-SU)
United States Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Subject: Response To EPA Letter Dated March 3, 1993 Relative To
1990, 1991, 1992 and 1993 Bottom Hole Pressure Falloff
Tests Conducted On WDW-14, WDW-32, WDW-49 and WDW-110
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas

Dear Mr. Weaver:

Enclosed herewith, in a report format, is our response to the list of deficiencies attached to the above letter. The report, generated by our consultants, Golden Environmental Services, Inc., is provided for your review and approval.

It should be noted that several of the deficiencies were on pressure falloff tests conducted in 1990 and 1991. As such, these tests were performed prior to issuance of the EPA Region 6 "Pressure Falloff Testing Guidelines".

Please contact me by telephone at 409/241-4197 should you have questions and/or comments pertaining to the report.

Very truly yours,

I. O. Coleman, Jr.
I. O. Coleman, Jr.

cjs
attachment

RECEIVED
WATER SUPPLY BRANCH
93 MAY 24 PM 1:14
6W-S
Hoechst 

HOECHST CELANESE CEMICAL GROUP
BAY CITY PLANT

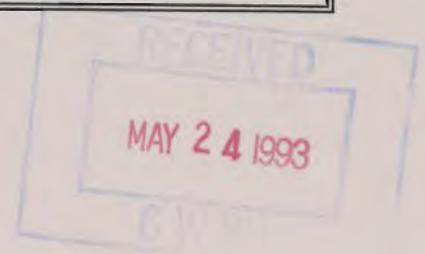
RESPONSE TO MAY 3, 1993

EPA NODS

Prepared By:

*Golden Environmental Services, Inc.
711 Louisiana Suite 1600
Houston, Texas 77002*

May 19, 1993



HOECHST CELANESE BAY CITY PLANT
Comments and Notice of Deficiencies
1990, 1991, 1992, and 1993 Pressure Tests
May 3, 1993

1. EPA COMMENT:

For all four wells, Celanese should provide a xerox copy of the 1" scaled Induction Log of the Upper Miocene injection interval.

Bay City Plant Response:

A copy of the logs were submitted previously to the EPA. See Petition, Section 3 - Geology, Appendix -3-4, Typical Logs for all Injection Wells.

2. EPA COMMENT:

Celanese used 0.556 cp as the formation fluid viscosity in the 1993 analysis for WDW-110. A viscosity of 0.71 cp was used for the Upper Miocene Formation in the analysis for the other three wells. Celanese should clarify which viscosity value is correct or use the appropriate value for the viscosity of the Upper Miocene Formation.

Bay City Plant Response:

The viscosity value of 0.71 cp is the appropriate value for the viscosity of the Upper Miocene Formation as discussed in the response to the 3/1/93 NODs. The viscosity value of 0.556 cp represents the effluent injected into WDW-110 as measured by Hoechst Celanese. The "kh" product for WDW-110 using 0.556 cp can be easily revised to reflect a new viscosity of 0.71 cp by multiplying kh by the ratio 0.71/.0556. This calculation yields a revised permeability of 1500 md.

3. EPA COMMENT:

In the response to Deficiency No. 4 of the March 1, 1993 NOD, Celanese was requested to determine the radius of investigation at the start of radial flow for the 1992 well tests for WDW-32 and WDW-49. In the calculations shown on Attachment 4, Celanese used a delta t of 88.5 hours. Celanese should justify this value. In addition, Celanese was also requested to estimate the waste front radii. Celanese should justify the use of 165 ft. as the interval thickness. A review of recent radioactive tracer surveys and the spinner results from WDW-110 indicates the majority of flow entering the top portion of the Upper Miocene interval.

MAY 24 1993



Bay City Plant Response:

From the analysis on both injection wells WDW-32 and WDW-49, it is not clear from the derivative plot as to which time radial flow begins. The 88.5 hours was taken from the Horner plot for both cases.

A thickness of 165 feet for the Upper Miocene injection interval was selected based on the approved No-Migration Petition's modeled thickness. The modeled thickness was based on the average net sand thickness for the injection interval in the injection wells and artificial penetrations within a mile radius of the Plant site. Even though the results from the recompletion in WDW-110 indicate that the majority of flow may be going into the upper portion of the interval, the entire interval is in communication with the completion after the injected fluid and pressure moves away from the well and oil into the formation. Injection in the Upper Miocene injection interval has been continuous at the plant site since 1964, with four wells completed in the interval (WDW-110's recompletion is the fifth completion in the interval). The average net sand interval thickness is appropriate for the calculation of plume radius from the wells due to the amount of historical injection and the fact that the entire interval is in communication with each of the completions, regardless of which portion of the completion is accepting the majority of flow at the present time. Spinner surveys only indicate where flow is going within the borehole, not within the formation.

WDW-110 (Well No. 1-A) February 16-17, 1993 falloff test:

1. EPA COMMENT:

The data on the log-log and derivative plot included in Appendix E of the recompletion report submitted for WDW-110 exceed the time scale of the plot. Celanese should submit a delta t vs delta t (hours) plot scaled so that all the test data is included on the plot. The start of radial flow should be identified on the plot. The log-log plot submitted incorporating the use of type curves may be used to support the results of the semilog analysis.

Bay City Plant Response:

The Fekete software program employed by Golden for the pressure falloff analysis automatically filters the data in order to maintain a manageable file size and scales the graphic plots. It appears that a few points were omitted from the log-log plot; however, the analytical results were not effected. The late time data were not used in the analysis. The request for a delta t vs delta t plot cannot be generated since identical values are plotted against themselves. The result would be a straight line. As such the start of radial flow cannot be determined by a delta t vs delta t plot.



cc: Mr. Phil Dellinger
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Mr. Joe Kordzi - w/o attachment
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Mr. Ben Knape
Geologist
Texas Water Commission
P. O. Box 13087, Capitol Section
Austin, TX 78711-3087

MAY 24 1993

2. EPA COMMENT:

No early time data is shown on the log-log- plot in Appendix E. Celanese should explain why no pressures were recorded during this interval. Celanese should also note the type of gauge used to measure pressures, when the gauge was last calibrated, and the accuracy of the gauge.

Bay City Plant Response:

The pressure reading of 1571.6 represents the first reading following shut in. The pressures fell off very rapidly due to the high permeability with low storage. The early time data are presented. The pressures were recorded and presented in Appendix A of the response. The type of gauge used was a Panex quartz crystal with an accuracy of 0.01 psi. It is not known when the gauge was last calibrated.

3. EPA COMMENT:

Celanese should submit an expanded Horner plot with the radial flow portion identified on the plot.

Bay City Plant Response:

An expanded plot is included as Attachment A. The expanded plot does not change the interpretation previously submitted since the straight line portion of the curve is clearly evident from the scale previously submitted.

4. EPA COMMENT:

The falloff analysis submitted in Appendix E reported a corrected flow time of 265.5 hours. The daily field operations summary reported in Appendix F reported WDW-110 was closed in at 2:30 pm February 16, 1993 (the day before the falloff test). Celanese should justify the use of 265.5 hours in the analysis.

Bay City Plant Response:

The daily field operations summary in Appendix F was incorrect about when the well was closed in. As is shown in the pressure data table submitted in the response as Appendix A, the bottom hole pressure recording equipment was lowered into the well on February 16 while fluid was being injected. The 265.5 hours in the analysis is the Horner corrected time.



WDW-14 (Well No. 2) November 29-30, 1992 falloff test:

1. EPA COMMENT:

Type curve solutions by themselves are not considered acceptable by the EPA since there is often not a single unique type curve match. However, a type curve match may be used to support the semilog analysis. The type curve provided for WDW-14 is not considered an adequate match of the log-log and derivation curves. Celanese should provide a log-log plot with derivation using a time scale in which delta t can be easily identified. The radial flow period should be illustrated on the log-log and an expanded Horner plot. The semilog straight line is included on the semilog plot.

Bay City Plant Response:

A log-log plot for WDW-14 is included as Attachment B.

The start of radial flow period is illustrated on a log/log plot which was submitted to the EPA as Figure 2.2 in Attachment 2a of the 3/17/93 response.

2. EPA COMMENT:

In the analysis, Celanese uses a thickness of 210 ft. The December 1, 1992 and October 29, 1991 radioactive tracer surveys show the slug going into the upper perforations with little or no flow entering the fill. Celanese should justify the 210 ft. thickness used for calculations or employ a more conservative value of h.

Bay City Plant Response:

The transmissivity derived from the well test was 177,900 millidarcy-feet per centipoise (md-ft/cp). A gross interval thickness of 210 feet for the Upper Miocene injection interval was selected to be conservative in the analysis. Even though only a portion of the completion is receiving flow, the entire interval is in communication with the completion as the injected fluid and pressure moves away from the well and oil into the formation. The transmissivity derived from the test will remain unchanged regardless of the thickness value selected. If the test is evaluated with the modeled interval thickness of 165 feet (net sand value), then the derived permeability would be approximately 766 md instead of the reported 602 md. The radius of investigation for the well test was over a mile beyond the wellbore. Therefore, the interval thickness should be used in the analysis instead of the estimated portion of the completion receiving flow.



bcc:

J. L. Popejoy	- Without Attached Document
K. Williams	- " " "
Mr. Don Squyers - Dupont	- " " "
Mr. Tom Jones - Golden Strata	- " " "
Anne Conely-Pitchell - Bridgewater Environmental File No. 203.13	

MAY 24 1993

4. EPA COMMENT:

Celanese should justify the injection time used to calculate the Horner time.

Bay City Plant Response:

In all cases where the injection rates vary prior to shut in, a superimposed time was used. In cases where the rate was constant, then the elapsed time was used.

WDW-32 (Well No. 3) September 14-15, 1992 falloff tests:

1. EPA COMMENT:

Celanese should state and justify the injection time interval used to calculate the Horner time of the semilog plot and the Agarwal equivalent time on the log-log plot.

Bay City Plant Response:

Please refer to the previous response regarding the time interval used. A log-log plot is included for WDW-32 as Attachment C with the Agarwal equivalent time.

WDW-49 (Well No. 4) September 19-22, 1992 falloff tests:

1. EPA COMMENT:

The derivative curve included in Attachment 1a in the response to the March 1, 1993 NOD is characteristic of a test dominated by constant pressure. No radial flow portion (flattening of the derivative curve) was observed. Celanese should define how the infinite acting portion of the semilog plot was determined.

Bay City Plant Response:

The straight line portion was determined by inspection of the Horner Plot.

2. EPA COMMENT:

Celanese should justify the use of a corrected flow time of 8760 hours.

Bay City Plant Response:

The corrected flow time of 8760 hours equals the total elapsed time because the injection rate was constant.



WDW-49 (Well No. 4) October 29-30, 1991 Falloff Test:

1. EPA COMMENT:

The derivative curve included as Figure 6 in the response to the September 2, 1992 NOD, demonstrates a characteristic of a test with a closed boundary. No radial flow portion was observed on the plot. Celanese should define how the infinite acting portion of the semilog plot was determined. The expanded Horner submitted in Figure 2 of the responses to the October 27, 1992 NOD was reported as having a slope of 3.6 psi/cycle.

Bay City Plant Response:

The infinite acting portion of the semilog plot was determined by fitting a straight line through the last few data points. It should be noted that this test was performed in 1991 prior to EPA guidelines. As such it was conducted to meet Texas Water Commission recommendations.

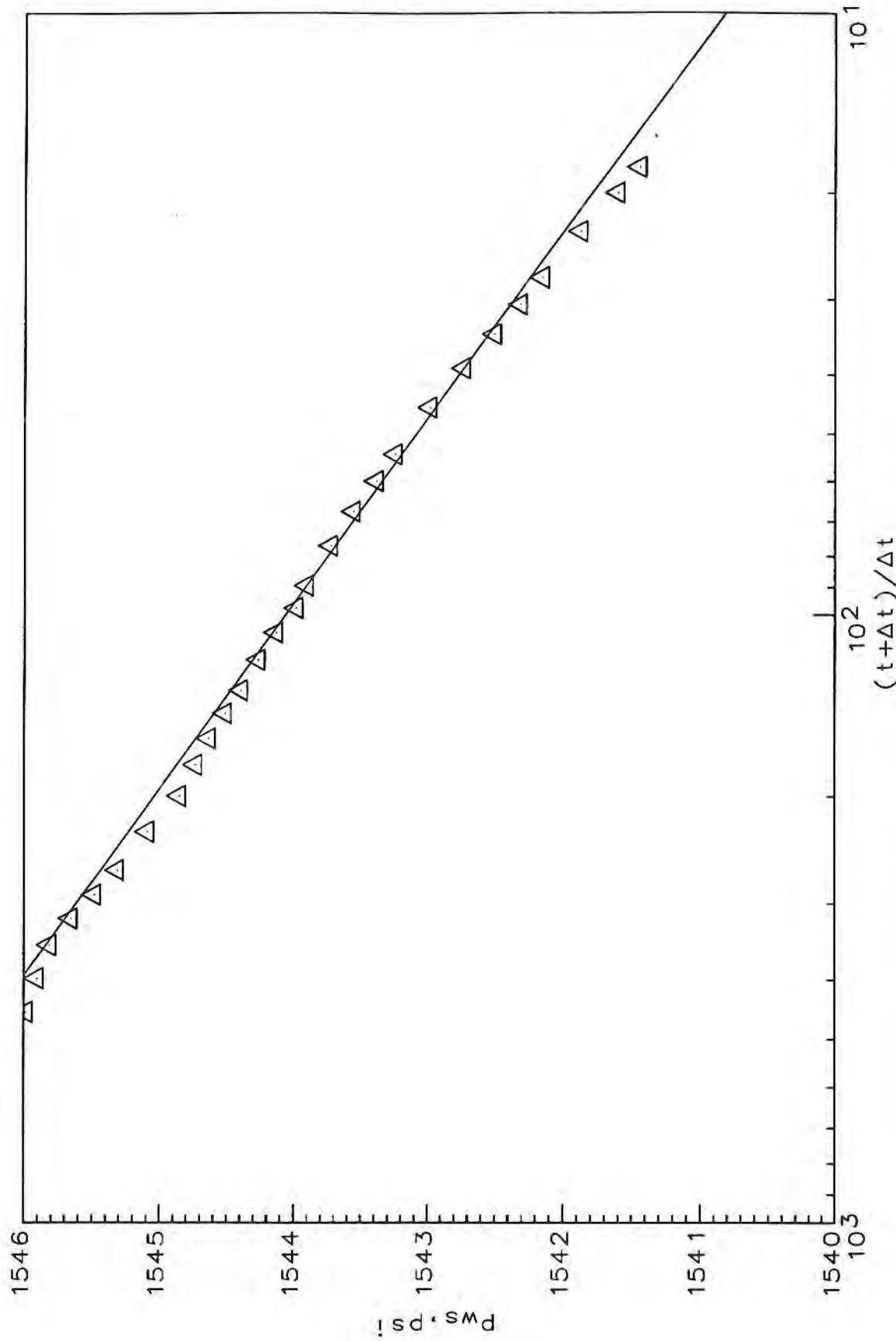


ATTACHMENT A



HORNER
PRESSURE FALLOFF PLOT
HOECHST CELANESE (BAY CITY)
WDW 110

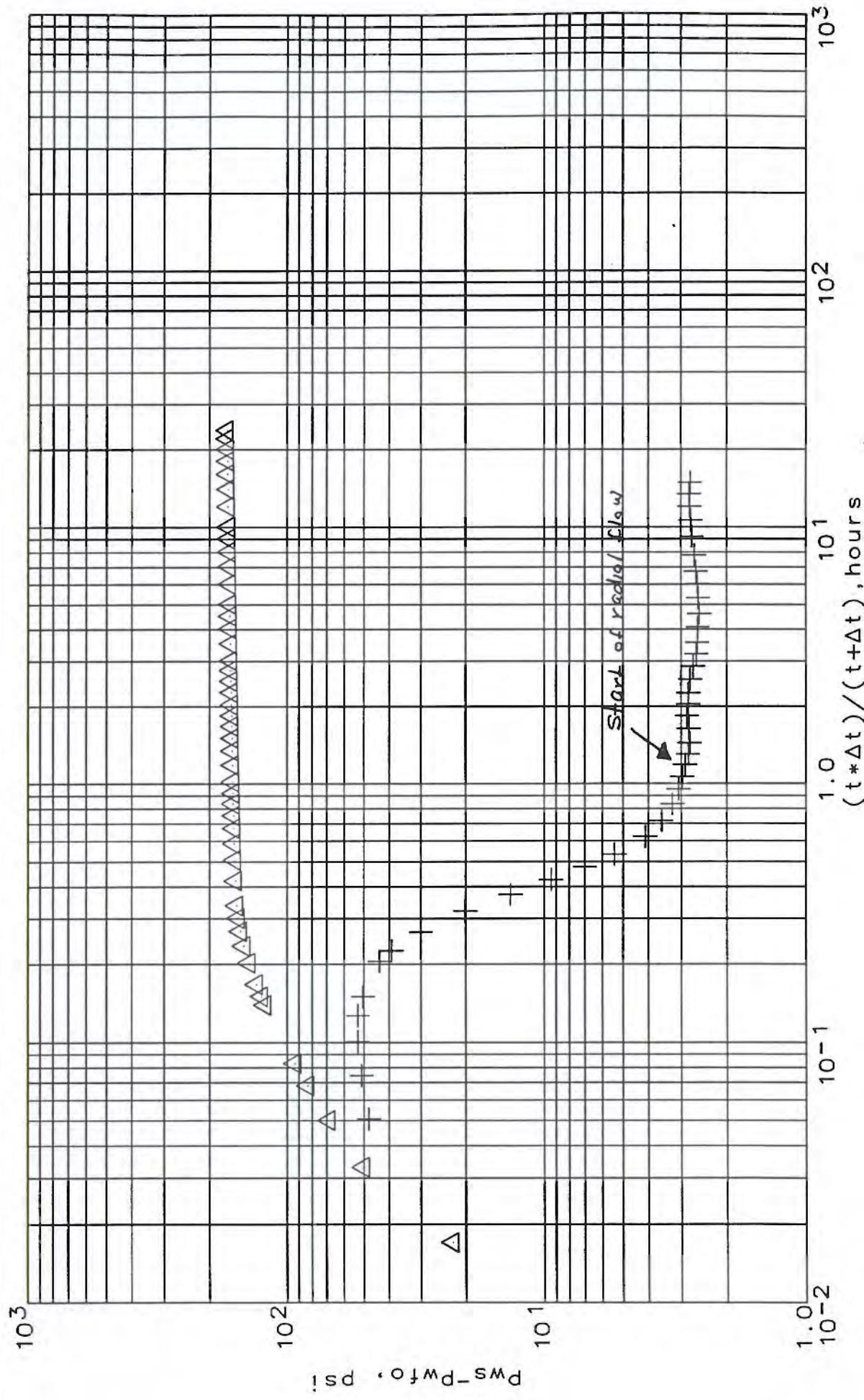
$[k_1/u]t = 2075.46$ $k_1 = 1153.95$ md $s = 28.5$ $p^* = 1537.6$



ATTACHMENT B



DIAGNOSTIC PREPLOT TYPECURVE
PRESSURE FALL-OFF PLOT
HOECHST CELANESE (BAY CITY)
WDW 14#2 PRESSURE FALL-OFF TEST
SEPTEMBER 1992

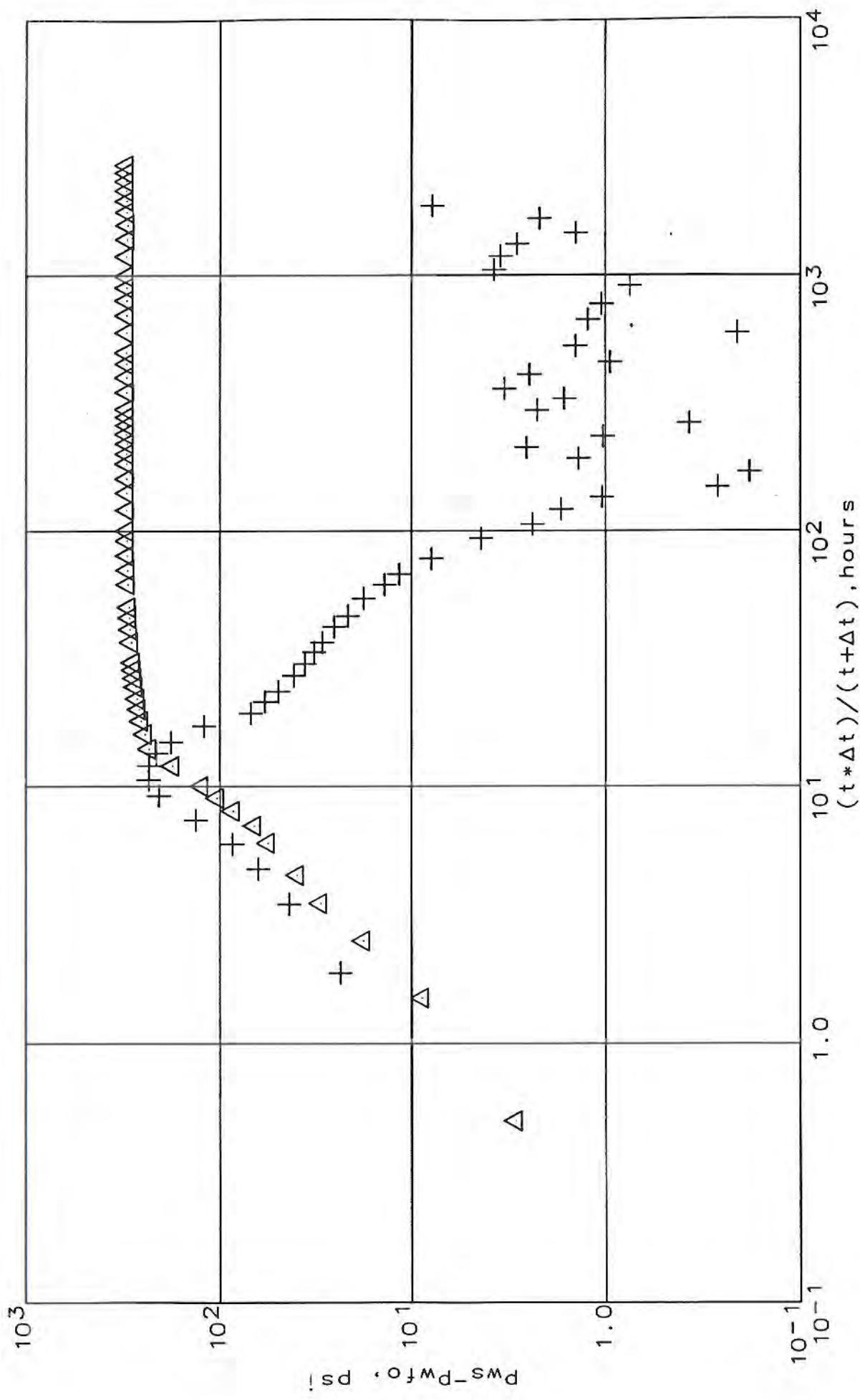


ATTACHMENT C



DIAGNOSTIC PREPLOT TYPECURVE
PRESSURE FALLOFF PLOT
HOECHST CELANESE (BAY CITY)
WDW 32

PRESSURE FALL-OFF TEST
SEPTEMBER 14-16, 1992



(4)

JAN 28 1998

CERTIFIED MAIL P 239 541 649 RETURN RECEIPT REQUESTED

Mr. I. O. Coleman
Environmental Affairs
Hoechst Celanese Chemical
Group, Incorporated
P.O. Box 509
Bay City, TX 77414

Dear Mr. Coleman:

EPA Region 6 has completed the second revision to the Pressure Falloff Testing Guideline for Class I hazardous waste injection wells. This guideline contains general information pertaining to the implementation and reporting of annual falloff tests required for compliance with the no migration petition approval conditions. The attached guideline contains general information that pertains to the majority of the facilities impacted. Because each site is unique, one guideline cannot be written to encompass all situations. Please review this guideline and ensure that future falloff testing submittals to Region 6 are properly conducted, and that the report includes all the information outlined in this guideline.

If you have any questions, please contact Susan Lopez at (214) 665-7198 or Joe Kordzi at (214) 665-7186.

Sincerely yours,

Philip Dellinger
Chief
Ground Water/UIC Section

Attachment

cc: Ben Knape, TNRCC

6WQ-SG:1/20/98:F:\USER\SHARE2\LBAN\WP50\CELANESE.BA\SLX7198\
2PFG98

6WQ-SG

5/21/98
1-21-98

6WQ-SG

J.K.
1-21-98

6WQ-SG

B.K.
1-21-98

Chemicals Division
Bay City Plant

Celanese Ltd.
Highway 3057
PO Box 509
Bay City, TX 77404-0509

Celanese

December 3, 1997
IOC-030-97

FEDERAL EXPRESS MAIL

Mr. Ben Knape - Head
Underground Injection Control (UIC) Team
UIC, Uranium, & Radioactive Waste Section
Industrial & Hazardous Waste Division
Texas Natural Resource Conservation Commission
12100 Park 35 Circle
Austin, Texas 78753

WDW-S

Subject: WDW - 110
Permit Modification
Proposed Permanent Closure Procedures/
Request For Extension Of Annual Mechanical Integrity Testing (MIT)
Hoechst Celanese Chemical Group, Ltd.
Bay City Site, Bay City, Texas

Dear Mr. Knape:

Enclosed are the proposed procedures for the permanent closure by plug and abandonment of WDW-110 for your review and approval. We also propose that the January 1997 MIT and ambient pressure measurement serve as the pre - closure testing. The well has not been in service during 1997 other than when the annual MIT (1/97) was performed.

Additionally, we request a 90 - day extension for performing the annual MIT which is scheduled for January 1998 and that the above proposed closure procedures be performed in lieu of the annual testing. Field operation for closure are scheduled to begin on January 12, 1998.

A check in the amount of \$100.00 is enclosed for the permit modification fee.

Your consideration to expedite review and approval of the above requests is very much appreciated.

Hoechst ■

Celanese
A member of the Hoechst Group

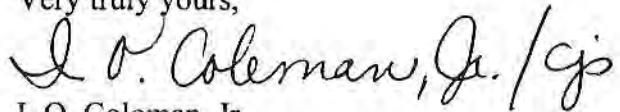
IOC-030-97

December 3, 1997

Page 2

Please contact me at 409/241-4197 or Mr. Mike Johnson, Terra Dynamics, Inc., Environmental Services at 512/795-8183 if you have questions.

Very truly yours,

A handwritten signature in cursive ink, appearing to read "I. O. Coleman, Jr."/cj.

I. O. Coleman, Jr.

Staff Environmental Chemist

(1)

RECORD OF COMMUNICATION		Phone Call	Conference	Date: 12-8-97
	X	Discussion	Other	Time:
TO: Bay City File		FROM: Susan Lopez, EPA		
SUBJECT: January 1997 Falloff Test for WDW-110				

SUMMARY:

Brian Graves received a copy of a letter dated December 3, 1997, from Celanese to the TNRCC concerning the plugging of WDW-110. Brian asked me if the January 1997 falloff test for the well had indicated any problems. I reviewed the falloff test and my earlier notes which indicated there was no pressure buildup observed in the falloff test. My records indicated the modeled initial reservoir pressure to be approximately 1555 psi at 3350'. The 1996 falloff test for WDW-110 that I reviewed had also shown no pressure problems resulting from injection activities. The December 3 letter stated that WDW-110 had not been in service since the January 1997 falloff test was conducted. Brian and I discussed the fact WDW-110 had not observed any pressure buildup over the past two years and since the well did not operate in 1997, another falloff test prior to plugging the well would not be needed.

Brian said he also questioned Gary Ishibashi about the January 1997 RAT. Gary told him that the 1997 RAT showed no indication of any channeling.

CONCLUSIONS/ACTIONS:

No falloff test approval letter was mailed to the facility concerning the 1997 test. The well is scheduled to be plugged in January 1998.

COPIES TO:

Celanese Bay City File
WAT 18-6-5-9

IOC-030-97

December 3, 1997

Page 3

cc:

Mr. Charles J. Green, Geologist
UIC Team Section
UIC, Uranium, & Radioactive Waste Section
Industrial & Hazardous Waste Division
Texas Natural Resource Conservation Commission
12100 Park Circle
P. O. Box 13087
Austin, Texas 78711-3087

Mr. Brian Graves
UIC Programs Section
Environmental Protection Agency
1445 Ross Avenue
Dallas, TX 75202-2733

HOECHST CELANESE CHEMICAL GROUP
P.O. BOX 509
BAY CITY, TX 77404

CHECK IS VOID IF COLORED BACKGROUND IS ABSENT

oechst Celanese

Hoechst 

CITIBANK  Delaware
A SUBSIDIARY OF CITICORP
ONE PENN'S WAY
NEW CASTLE, DE 19720

62-20
311

CHECK NUMBER

43006955

DATE

12/02/97

AMOUNT

\$100.00

PAY TO THE
ORDER OF

TEXAS NATURAL RESOURCE
CONSERVATION COMMISSION
P. O. BOX 13087
AUSTIN, TX 787113087

787113087

 HOECHST CELANESE
CORPORATION 

AUDITED

43006955 10311002091 38727758

VENDOR # 10014644 TEXAS NATURAL RESOURCE

CHECK # 43006955

INVOICE NUMBER	INVOICE DATE	NET AMOUNT	INVOICE NUMBER	INVOICE DATE	NET AMOUNT
CK REQ 11/28/97	12/02/97	100.00			

THIS CHECK IS IMPRINTED WITH THE HOECHST
CELANESE OFFICIAL CHECK SIGNATURE

**PERMANENT CLOSURE BY PLUG AND ABANDONMENT
OF WDW-110**

Prepared for

**Hoechst Celanese Chemical Group, Ltd.
Bay City Plant
Bay City, Texas**

**November 26, 1997
TDI PROJECT NO. 97-165**

(Revision 1)

Task 1 Procedures for Mobilization and Equipment Rig Up

1. Travel to Celanese facility from Austin. Meet with facility and rig personnel to discuss project objectives and to determine workover equipment layout and space requirements. Notify TNRCC of upcoming operations and scheduling. Assure that a fresh water line has been run to well location.
2. Move in and rig up workover unit and support equipment. Install guy wires to rig anchors per pulling unit specifications (or rig up on base beam if rig anchors are not available). Set catwalk, one sets of pipe racks, rig pump and tank. Move in and fill 500 bbl mobile frac tank with fresh water.
3. Flush well with 350 barrels of fresh water (buffer fluid). Assure that well is dead. Nipple down injection tree and wellhead.
4. Nipple up 11-inch, 3,000 psi x 11-inch, 5,000 psi adapter spool, and nipple up 11-inch, 5,000 psi double blowout preventer (BOPs) with 2 7/8-inch rams to wellhead.

Task 2 Procedures for Removing Existing 5 1/2-inch Injection Tubing and 9 5/8-Inch Casing/Cement Inspection Logging

1. Rig up casing power tongs and lay down machine to pull 5 ½-inch injection tubing. Release existing 5 ½-inch tubing from packer and trip out of hole while laying down 5 ½-inch injection tubing.
2. Rig up loggers and run casing inspection logging suite consisting of multifinger caliper from top of packer to surface. Run cement bond log from TIW model "LH" packer at 3,175 feet to 1,000 feet (or to base of surface casing). Rig down and release loggers.

Task 3 Well Plugging Procedures

1. Mobilize and unload 3,200 feet of 2 7/8-inch 6.5 lb/ft workstring tubing to well site.
2. Pick up cement retainer and cementing stinger and run in hole on 2 7/8-inch workstring. Set retainer at approximately 3,160 feet (just above TIW model "LH" packer). Load 2 7/8-inch x 9 5/8-inch annulus with fresh water and pressure test to 500 psi.
3. Mix and pump 275 sacks of premium plugging cement to plug perforated interval and lower wellbore (beneath TIW model "LH" packer) from 3,800 feet to cement retainer at 3,160 feet. Unsting from retainer and allow final 10-20 sacks to circulate on top of retainer.
4. Pull up hole to 2,000 feet and shut down overnight to allow cement plug (Plug No. 1) to set.
5. Run in hole with workstring and tag top of Plug No. 1. Record depth to top and pressure test plug to 1,000 psi.
6. Mix and pump 650 sacks of premium cement in 216 sack increments from top of plug no. 1 to 1,500 feet while standing back tubing from top of Plug No. 1 to 1,500 feet. Pull out of hole while laying down remaining tubing from 1,500 feet. Shut down overnight and allow cement plug (Plug No. 2) to set.
7. Run in hole with workstring and tag top of Plug No. 2. Record depth to top and pressure test plug to 1,000 psi.
8. Mix and pump 602 sacks of premium cement in 200 sack increments from top of Plug No. 2 to surface while laying down. Clear cement from BOP and top five feet of casing. Shut down overnight to allow cement plug (Plug No. 3) to set.
9. Excavate around casing. Cut off wellhead and weld plate on top of casing. Weld monument to plate. Rig down and release workover rig and all support equipment. Dispose of waste materials in appropriate manner.
10. Make color photograph of well monument for closure report.

**PERMANENT CLOSURE BY PLUG AND ABANDONMENT
OF WDW-110**

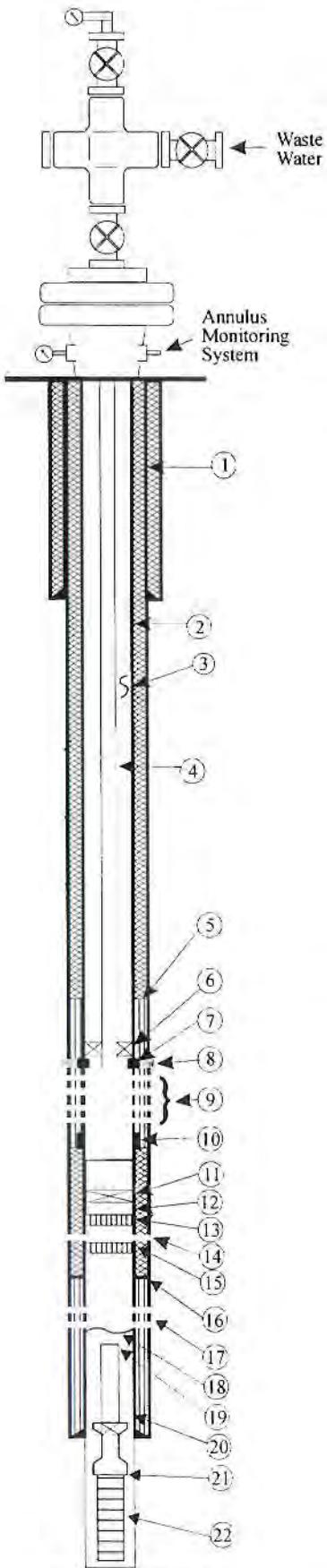
PROPOSED SCHEDULE

**Prepared for
Hoechst Celanese Chemical Group, Ltd.
Bay City Plant
Bay City, Texas**

**November 26, 1997
TDI PROJECT NO. 97-165**

Activity	Days to Complete Activity	Date
Finish Mobilization and Rig up Equipment	1/2	1/12/97
Flush Well, remove Injection Tree, Nipple up BOP	1/2	11/12/97
Pull 5 ½-Inch Injection Tubing,	1	11/13/97
Conduct Casing and Cement Inspection Logs	1	11/14/97
Run, Set and Test Cement Retainer	1	11/15/97
Cement Lower Wellbore through Retainer (Plug No. 1)	1	11/16/97
Tag and Test Plug No. 1, Pump and Set Plug No. 2	1	11/17/97
Tag and Test Plug No. 2; Pump and Set Plug No. 3	1	11/18/97
Cut off Wellhead, Erect Monument, Rig Down and Release Equipment	1	11/19/97

BELOW GROUND DETAIL



1. **SURFACE CASING :**
13 3/8", 54.5 lb/ft, K-55, set to 1,396'.
2. **LONGSTRING CASING :**
9 5/8", 40 lb/ft, K-55, and 9 5/8", 43 lb/ft, N-80, set to 5,656'.
3. **ANNULUS FLUID :** Inhibited Brine.
4. **INJECTION TUBING :** 5 1/2" carbon steel set into packer at approximately 3,330'.
5. **PLASTIC RESIN CEMENT :** From DV Tool (3,694') to 3,050'.
6. **PACKER :** 5 1/2" x 9 5/8", 316 SS TIW, Set at 3,330'.
7. **CASING PATCH :** HOMCO 0.15" wall carbon steel, from 3,350'-3,370'.
8. **CEMENT SQUEEZE :** Perforated at 4 SPF from 3,358'-3,360'. Two squeezes using Premium Cement and Halliburton "Micromix".
9. **PERFORATIONS :** (5 shots/ft, 0.42" hole) as follows:
3,376' to 3,426' 3,460' to 3,471'
3,494' to 3,524' 3,543' to 3,572'
10. **DV TOOL :** Set at 3,694'.
11. **BRIDGE PLUG :** Cast iron, set at 4,616'.
12. **CEMENT PLUG :** Common cement, from 3,800' to 4,718'.
13. **EPOXY SQUEEZE :** Top of Epoxy at 4,718'.
14. **PERFORATIONS :** 4 shots/ft. from 5,196' to 5,206'.
15. **EPOXY SQUEEZE :** Top of Epoxy at 5,224'.
16. **EPOXY CEMENT :** Top of original Epoxy cement at 5,255'.
17. **PERFORATIONS :** 4 shots/ft. from 5,480' to 5,500' and 5,538' to 5,548'.
18. **TOP OF FILL :** Top of sand fill at 5,548'.
19. **TOP OF FIBERGLASS :** Top of original fiberglass tubing at 5,597'.
20. **BLANKING PLUG :** Stainless AVA Blanking Plug.
21. **OVERSHOT ASSEMBLY :** Overshot on top of Abandoned Screen at approximately 5,656'.
22. **ABANDONED SCREEN**

Figure 1

TERRA DYNAMICS INC			
CURRENT CONSTRUCTION SCHEMATIC FOR WDW-110			
PREPARED FOR			
HOECHST CELANESE CHEMICAL GROUP, INC. BAY CITY PLANT, TEXAS			
DRAWN BY:	Mike Eide	SCALE:	DATE:
DESIGNED BY:	Mike Johnson	Not to Scale	11/26/97
CHECKED BY:	B. Bierman	JOB NO	97-165

March 10, 1997
IOC-009-97

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

FEDERAL EXPRESS MAIL

Ms. Alice Hamilton Rodgers, P.E., Manager
UIC, Uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division (MC-131)
Texas Natural Resource Conservation Commission
12100 Park 35 Circle
Austin, Texas 78753

Subject: Mechanical Integrity Testing (MIT) (Annulus Pressure Test Data)
Bottom Hole Pressure Falloff (BHPF) Report
WDW-110 (Plant Well No. 1A)
Hoechst Celanese Chemical Group, Ltd.
Bay City Plant, Bay City, Texas

Dear Ms. Rogers:

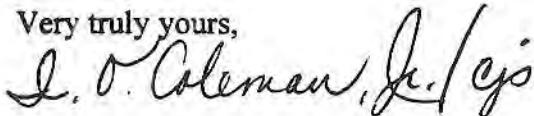
Enclosed herewith are two copies of the Annulus Pressure Test Data (strip chart) which was inadvertently left out of the MIT reports for WDW-110. This strip chart provides a triplicate of the information contained within the report. Place the strip chart as the last page of Appendix A.

The initial data was submitted February 27, 1997 by Federal Express under letter no IOC-007-97.

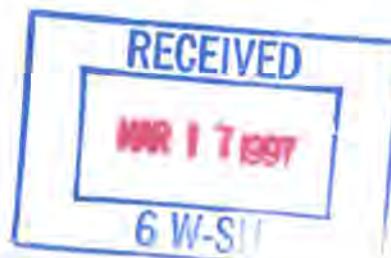
The testing occurred between January 21 through 23, 1997 and was performed by our Contractor, ECO Solutions, Inc., Houston, Texas.

Please do not hesitate to contact our Mr. B. S. Barrington at 409/241-4413, Mr. P. H. Richardson at 409/241-4132 or me at 409/241-4197 if you have questions concerning the report.

Very truly yours,



I. O. Coleman, Jr.
Staff Environmental Chemist



IOC-009-97
March 10, 1997
Page 2

cc:

B. R. Hightower → P. H. Richardson
R. S. O'Neal → B. S. Barrington
Environmental File No.: 203.13

RECEIVED

97 MAR 13 PM 1:04

AR/OK/TX BRANCH

Mr. Phil Dellinger
Environmental Protection Agency
Underground Injection Control Program
1445 Ross Avenue
Dallas, TX 75202-2733



February 21, 1997
IOC-007-97

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

FEDERAL EXPRESS MAIL

Ms. Alice Hamilton Rodgers, P.E., Manager
UIC, Uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division (MC-131)
Texas Natural Resource Conservation Commission
12100 Park 35 Circle
Austin, Texas 78753

Subject: Mechanical Integrity Testing (MIT)
Bottom Hole Pressure Falloff (BHPF) Report
WDW-110 (Plant Well No. 1A)
Hoechst Celanese Chemical Group, Ltd.
Bay City Plant, Bay City, Texas

Dear Ms. Rogers:

Enclosed herewith are two copies of the subject MIT/BHPF reports for WDW-110. These reports are submitted for your review and approval. Inserted in a pocket at the back of each report is a disk which contains the "Pressure Falloff" data that was performed on the well as part of the MIT.

The testing occurred between January 21 through 23, 1997 and was performed by our Contractor, ECO Solutions, Inc., Houston, Texas.

All of the tests, the Bottom Hole Pressure/Falloff (BHP/F), the Annulus Pressure Test (APT) and the Radioactive Tracer (RAT) Survey, supported the conclusions that: 1) there was good agreement between the measured data and modeled response relative to the BHP/F, 2) the well demonstrated internal integrity based on the results of the APT and 3) the well demonstrated external integrity based on the results of the RAT survey.

Please do not hesitate to contact our Mr. B. S. Barrington at 409/241-4413, Mr. P. H. Richardson at 409/241-4132 or me at 409/241-4197 if you have questions concerning the report.

Very truly yours,

I. O. Coleman, Jr./gc
I. O. Coleman, Jr.

Staff Environmental Chemist

RECEIVED
97 MAR -3 PM 4:17
AM/01/97, T, B, P, D, G, L, U



IOC-007-97
February 21, 1997
Page 2

cc: w/o attachment

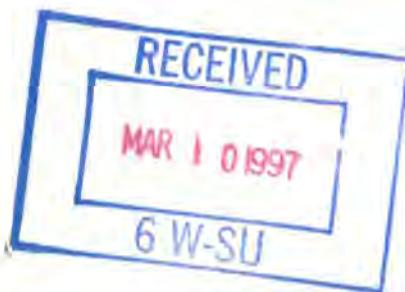
Mr. Ben Knape, Chief
Underground Injection Control Unit
UIC, Uranium & Radioactive Waste Section
Industrial and Hazardous Waste Division
TX Natl Resource Conservation Commission
P. O. Box 13087
Austin, TX 78711-3087

Mr. Charles J. Green, Geologist
TX Natl Resource Conservation Comm.
Underground Injection Control Team
UIC, Uranium & Radioactive Waste Section
Industrial and Hazardous Waste Division
P. O. Box 13087
Austin, TX 78711-3087

Mr. Jim L. Boswell, Permit Coordinator
Underground Injection Control Team
UIC, Uranium & Radioactive Waste Section
TX Natl Resource Conservation Commission
P.O. Box 13087
Austin, TX 78711-3087

w/attachment:

Mr. Phil Dellinger
Environmental Protection Agency
Underground Injection Control Program
1445 Ross Avenue
Dallas, TX 75202-2733



(4)

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

December 12, 1996

IOC-058-96

FEDERAL EXPRESS MAIL

Ms. Alice Hamilton Rogers, P.E., Manager
UIC, Uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division (MC-131)
Texas Natural Resource Conservation Commission
12100 Park 35 Circle
Austin, TX 78753

Subject: WDW-110 (PLANT WELL NUMBER 1A)
PROPOSED MECHANICAL INTEGRITY TEST PROCEDURES
HOECHST CELANESE CHEMICAL GROUP, LTD.
BAY CITY PLANT, BAY CITY, TX

Dear Ms. Hamilton:

Enclosed herewith as Addendum I are the proposed Mechanical Integrity Test (MIT) Procedures to demonstrate mechanical integrity of WDW-110 (Plant Well No. 1A) which are provided for your review and approval. Our plan is to conduct the testing during the week of January 20, 1997.

We appreciate in advance your consideration, review and approval of the above request.

Please don't hesitate to contact me at 409-241-4197 or Mr. B.S. Barrington at 409-241-4413 if you have any questions concerning this matter.

Very truly yours,

I. O. Coleman, Jr./cj

I. O. Coleman, Jr.
Staff Environmental Chemist

IOC/cjs
attachment



IOC-058-96

December 12, 1996

Page 2

cc:

Mr. Jim L. Boswell, Permit Coordinator
Underground Injection Control Team (MC-131)
UIC, Uranium & Radioactive Waste Section
TX Natl Resource Conservation Commission
P.O. Box 13087
Austin, TX 78711-3087

Mr. Phil Dellinger
UIC State Programs Section (6W-SU)
Environmental Protection Agency
1445 Ross Avenue
Dallas, TX 75202-2733



ADDENDUM I

PROPOSED PROCEDURE TO

DEMONSTRATE MECHANICAL

INTEGRITY FOR WDW-110

(WELL 1A)



HOECHST CELANESE CHEMICAL GROUP, LTD.
BAY CITY FACILITY

PROPOSED PROCEDURE TO DEMONSTRATE
MECHANICAL INTEGRITY TESTING
FOR WDW-110 (WELL #1-A)

The following step-by-step proposed procedures were developed in accordance with the Underground Injection Control (UIC) and the Hazardous Waste Disposal Injection Restrictions (HWDIR) Programs as issued by the United States Environmental Protection Agency (US EPA) and promulgated by the Texas Natural Resource Conservation Commission (TNRCC).

Except where noted, all steps of this procedure will be performed by ECO's personnel.

- 1) Request and secure approval from the TNRCC to demonstrate mechanical integrity testing (MIT). (ECO/HCCG)
 - * Define annulus pressure test and downhole logging procedures.
 - * Draft a letter including MIT procedures for review and approval by HCCG's personnel which will provide formal notification to the TNRCC of the intent and scope to demonstrate MIT.
 - * Modify these procedures as per HCCG's comments and submit to the TNRCC for review and approval.
- 2) Prepare well for MIT. (HCCG)
 - * Check wellhead valves to insure that special fittings can be easily installed during the MIT. ECO requests that 2" NPT connections be available on the tubing outlets.
 - * Since wireline services will be run while injecting into the well, a full opening valve (minimum 2" inside diameter) will be required on top the wellhead above the inlet effluent flowline.
 - * HCCG's personnel will maintain proper annulus pressure while conducting the RAT survey. HCCG will provide historical petition data on Well #1-A for ECO's personnel for use in the report preparation.

- 3) Perform bottom hole pressure fall-off and static bottom hole pressure (BHP) survey. (ECO/HCCG)
 - * HCCG is to inject non-hazardous effluent into Well #1-A at a constant and stable high rate (+/-225 gpm) for a minimum of four days prior to performing the falloff test. HCCG will furnish non-hazardous fluid.
 - * Move in and rig up wireline unit to run bottom hole pressure (BHP) falloff test with surface readout Panex BHP gauges.
 - * Go in the hole with BHP gauges and correlate depth measurement to packer depth, and pull BHP tool up to +/-3300', or to the depth previously performed BHP surveys have been conducted.
 - * Secure a representative sample of the effluent pumped into Well #1-A. Transmit fluid sample to the HCCG laboratory for analysis.
 - * Shut-in well. Leave well shut-in for \pm 48 hours, or until tubing pressure stabilizes, to obtain pressure decay data. Data obtained at the end of this test will provide static BHP.
- 4) Perform annulus/tubing differential pressure test (APT). (HCCG/ECO)
 - * Rig up digital pressure transducer units and install onto the annulus and tubing outlet.
 - * HCCG's personnel will adjust annulus pressure to 1000 psi higher pressure above the tubing pressure.
 - * Monitor annulus/tubing pressures for a minimum period of 30 minutes. Maximum allowable differential pressure change during the APT is 5% of the maximum differential test pressures.
 - * Rig down transducer pressure units.
- 5) Run radioactive tracer survey. (ECO)
 - * Establish \pm 50 gpm injection rates utilizing HCCG's injection pump and non-hazardous effluent.

ECO Solutions, Inc.

Environmental Consulting and Technical Services

- * Rig up gamma ray (G/R) detector, casing collar locator (CCL) and radioactive tracer (R/A) ejector tool. Ejector contains ± 10 millicuries of Iodine "131" radioactive solution.
 - * Continue pumping effluent into the well at a rate of ± 50 gpm.
 - * Run G/R base log from PBTD (tag bottom) to $\pm 300'$ above the packer (@ 3,330'), or up to $\pm 3,000'$. Make short repeat G/R run to prove tool repeatability.
 - * Run one (1) five-minute statistical log at a depth of 3,310'.
 - * Release first R/A slug inside tubing $\pm 300'$ above the packer while pumping effluent down the tubing at an injection rate of ± 50 gpm. Make multiple recorded passes following the R/A slug (1) down the tubing, (2) into the borehole and (3) into the disposal zone until the R/A slug virtually disappears and cannot be distinguished from the normal background G/R radioactivity. Repeat the multiple pass survey.
 - * Release second R/A slug from tool at $\pm 20'$ above top perforation, or at $\pm 3,310'$ and hold stationary. Place recorder on time-drive sequence. Logging time will be predetermined based on actual injection rate as agreed upon by the TNRCC inspector.
 - * Repeat stationary sequence test above.
 - * Run final base G/R from PBTD to +/-300' above the packer (same interval as original base G/R log) to verify that all R/A materials have been flushed into the disposal zone and that no fluid is migrating up behind the casing string.
 - * Pull out of the hole and rig down wireline..
- 6) MIT field work is completed on Well #1-A. (ECO)
- * Rig down all rental equipment and move off the location.
 - * Advise TNRCC of test results and that well is, or is not, acceptable for injection service. If the MIT fails, submit a workover procedure to the TNRCC. Note: This latter work is not included in the scope of this project.
 - * If Well #1-A has successfully passed all MIT tests, then return the well to shut-in (standby) status.

ECO Solutions, In

Environmental Consulting and Technical Services

7) Submit MIT report. (ECO/HCCG)

- * Prepare a draft copy of the MIT report detailing the demonstration of MIT on WDW-110 (Well #1-A).
- * Submit draft report to HCCG for comments and approval.
- * Modify the MIT report as per HCCG's comments and submit copies of final MIT report to HCCG. HCCG personnel will transmit final MIT report to the TNRCC.
- * Receive TNRCC's acceptance letter pertaining to the MIT report.

8) Mechanical Integrity Testing Complete.

(mt)
4

May - 2 1996

CERTIFIED MAIL P 239 541 663 RETURN RECEIPT REQUESTED

Mr. I. O. Coleman, Jr.
Hoechst Celanese Corporation
Bay City Plant
P. O. Box 509
Highway 3057
Bay City, Texas 77404-0509

Dear Mr. Coleman:

We have completed the review of the pressure falloff test conducted in March 1996 for well WDW-49. Based on this review, the EPA has determined that Petition Approval Condition No. 8 has been fulfilled for the year May 4, 1995 to May 4, 1996 for well WDW-49.

If you have any questions or comments please contact Susie Lopez at (214) 665-7198.

Sincerely yours,

Larry Wright
Chief
Ground Water/UIC Section

cc: Ben Knape, TNRCC

6WQ-SG:HOWARD:5/2/96:F:\USER\SHARE2\LBAN\WP50\CELANESE\
CELANES.BA\ANL.95
6WQ-SG 6WQ-SG
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 5-2-96

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APR 17 1996

6 W-S

Hoechst Celanese

Chemical Group

Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

April 12, 1996
IOC-023-96

FEDERAL EXPRESS MAIL

Mr. Ben Knape, Chief
Underground Injection Control Unit
UIC, Uranium & Radioactive Waste Section
Industrial and Hazardous Waste Division
TX Natl Resource Conservation Commission
12100 Park 35 Circle
Austin, TX 78753

Subject: Mechanical Integrity Testing (MIT)/
Bottom Hole Pressure Falloff (BHPF) for
WDW-49 (Plant Well No. 4) Report
Hoechst Celanese Chemical Group, Ltd.
Bay City Plant, Bay City, Texas

Dear Mr. Knape:

Enclosed herewith are two copies of the subject MIT/BHPF reports for your review and approval. Also, inserted in a pocket at the back of each report is a disk which contains the "Pressure Falloff" data that was performed on the well as part of the MIT. The testing occurred between March 7 through March 14, 1996 and was performed by our Contractor, ECO Solutions, Inc., Houston, TX.

Please do not hesitate to contact our Mr. H. R. Horton at 409/241-4076, Mr. B. S. Barrington at 409/241-4413 or me at 409/241-4197 if you have questions concerning the report.

Very truly yours,

I.O. Coleman, Jr.
I. O. Coleman, Jr.
Staff Environmental Chemist

IOC/cjs
attachment

Hoechst 

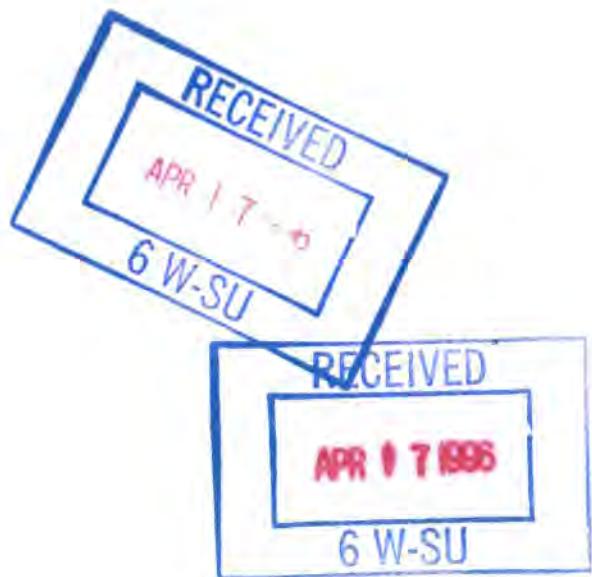
IOC-023-96
April 12, 1996
Page 2

cc:

Mr. Charles J. Green, Geologist - w/o attachment
TX Natl Resource Conservation Comm.
Underground Injection Control Team
UIC, Uranium & Radioactive Waste Section
Industrial and Hazardous Waste Division
P. O. Box 13087
Austin, TX 78711-3087

Mr. Jim L. Boswell, Permit Coordinator - w/o attachment
Underground Injection Control Team
UIC, Uranium & Radioactive Waste Section
TX Natl Resource Conservation Commission
P.O. Box 13087
Austin, TX 78711-3087

Mr. Phil Dellinger
Underground Injection Control Program
Environmental Protection Agency
1445 Ross Avenue
Dallas, TX 75202-2733



Hoechst Celanese

(4)
Chemical Group

Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

February 23, 1996
IOC-016-96

FEDERAL EXPRESS MAIL

Mr. Ben Knape, Chief
Underground Injection Control Unit
UIC, Uranium & Radioactive Waste Section
Industrial and Hazardous Waste Division
TX Natl Resource Conservation Commission
12100 Park 35 Circle
Austin, TX 78753

Subject: Mechanical Integrity Testing (MIT)
 Bottom Hole Pressure Falloff (BHPF) for
 WDW-110 (Plant Well No. 1-A)Report
 Hoechst Celanese Chemical Group, Ltd.
 Bay City Plant, Bay City, Texas

Dear Mr. Knape:

Enclosed herewith are two copies of the subject MIT/BHPF reports for your review and approval. Also, inserted in a pocket at the back of each report is a disk which contains the "Pressure Falloff" data that was performed on the well as part of the MIT. The testing occurred between January 23 and 25, 1996 and was performed by our Contractor, ECO Solutions, Inc., Houston, TX.

Please do not hesitate to contact our Mr. H. R. Horton at 409/241-4076 or me at 409/241-4197 if you have questions concerning the report.

Very truly yours,

I. O. Coleman, Jr./jg
I. O. Coleman, Jr.
Staff Environmental Chemist

IOC/cjs
attachment



IOC-016-96
February 23, 1996
Page 2

cc:

Mr. Charles J. Green, Geologist - w/o attachment
TX Natl Resource Conservation Comm.
Underground Injection Control Team
UIC, Uranium & Radioactive Waste Section
Industrial and Hazardous Waste Division
P. O. Box 13087
Austin, TX 78711-3087

Mr. Jim L. Boswell, Permit Coordinator - w/o attachment
Underground Injection Control Team
UIC, Uranium & Radioactive Waste Section
TX Natl Resource Conservation Commission
P.O. Box 13087
Austin, TX 78711-3087

Mr. Phil Dellinger
Underground Injection Control Program
Environmental Protection Agency
1445 Ross Avenue
Dallas, TX 75202-2733



ECO SOLUTIONS, INC.

9800 Richmond Avenue Suite 320 - Houston, Texas 77042 - (713) 780-1955 FAX (713) 780-0870

November 13, 1995

Mr. Ray Horton
Hoechst Celanese Chemical Group, Inc.
Bay City Plant
Post Office Box 509
Bay City, Texas 77404-0509

RE: Final Mechanical Integrity Test & Bottom Hole Pressure/Falloff Survey Report
For WDW-32 (Well No. 3), Bay City Plant

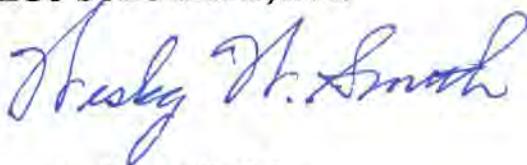
Dear Mr. Horton:

Enclosed are five copies of the final report of the Mechanical Integrity Test (MIT) & Bottom Hole Pressure/Falloff Survey for Hoechst Celanese Chemical Group, Inc.'s (HCCG) WDW-32 (Well No. 3).

All tests and surveys on WDW-32 were conducted according to the Texas Natural Resources Conservation Commission's MIT and Bottom Hole Pressure/Falloff Survey guidelines for a Class I waste injection well operating in the State of Texas. If you have any questions regarding either the field operations or this report, please call me at our Houston office at (713)780-1955 or via FAX at (713)780-0870.

Sincerely,

ECO SOLUTIONS, INC.



Wesley W. Smith, P.E.
Vice President/UIC

cc: I. O. Coleman (HCCG)
Thomas Jones (ECO)





November 27, 1995
IOC-077-95

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

FEDERAL EXPRESS MAIL

Mr. Phil Dellinger
Underground Injection Control Program
Environmental Protection Agency
1445 Ross Avenue, Suite #1200
Dallas, Texas 75202-2733

Subject: WDW-32 (PLANT WELL NUMBER 3)
1995 MECHANICAL INTEGRITY TESTING AND
BOTTOM HOLE PRESSURE/FALLOFF SURVEY REPORT
HOECHST CELANESE CHEMICAL GROUP, INC.
BAY CITY PLANT, BAY CITY, TEXAS

Dear Mr. Dellinger:

Please find enclosed herewith a copy of a letter from Mr. Wesley W. Smith, ECO Solutions, Inc., dated November 13, 1995, with the referenced 1995 Mechanical Integrity Testing and Bottom Hole Pressure/Falloff Survey Report for WDW-32.

This report is provided for your information and file. Two copies of the report were hand delivered to the Texas Natural Resource Conservation Commission Underground Injection Control personnel on Tuesday, November 14, 1995.

I can be contacted by telephone at 409/241-4197 if you have questions.

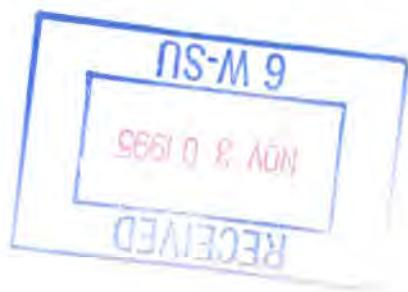
Very truly yours,

I.O. Coleman Jr.
I. O. Coleman, Jr.
Staff Environmental Chemist



11/27/95

cc: Mr. Ben Knape, Head
Underground Injection Control Unit
Texas Natural Resource Conservation Commission
P. O. Box 13087
12100 Park 35 Circle
Austin, Texas 78711-3087



NOV 30 1994

CERTIFIED MAIL P 885 488 119 RETURN RECEIPT REQUESTED

Mr. I. O. Coleman, Jr.
Hoechst Celanese Corporation
Bay City Plant
P. O. Box 509
Highway 3057
Bay City, Texas 77404-0509

Dear Mr. Coleman:

We have completed the review of the pressure falloff test conducted in February, 1994 for Well WDW-14 and in March, 1994 for Well WDW-110. Based on this review, the EPA has determined that Petition Approval Condition No. 7 has been fulfilled for the year May 4, 1994 to May 4, 1995 for wells WDW-14 and WDW-110.

If you have any questions or comments please contact Joe Kordzi at (214) 665-7186 or me at (214) 655-7142.

Sincerely yours,

Phil Dellinger
Unit Leader
UIC State Programs/Land Ban

cc: Ben Knape, TNRCC

6W-SU:HOWARD:11/18/94:MH:H:\WP50\EMPAK\ANLT.94
6W-SU 6W-SU
KORDZI DELLINGER

JK 11/23/94

PD 11/30/94

DISPOSAL WELL INSPECTION CHECKLIST

Permit # WDW 49Inspection Date(s) 3-20-95Section 6 EPA NO-MIGRATION PETITION APPROVAL CONDITIONS

1. Is the operator disposing of more waste volume than is allowed in the petition conditions? YES NO

Petition Value 750 gal/minObserved Value N/A See comment gal Time Period _____

2. Is the operator's waste stream complying with the specific gravity or density conditions of the petition? YES NO

Petition Value or Range 1.10Observed Value or Range N/A See comment Date(s) _____

3. Is the operator disposing of any hazardous waste that has a waste code that is not included in the petition condition list of approved waste codes? YES NO

List wastes being disposed that aren't on the approved list:

Comments:

This well was out of service at the time of inspection.

Note: If the answer to any of the above questions is the bolded answer, this means that the operator may be out of compliance with the EPA approved no-migration petition and the EPA needs to be notified of this situation as soon as possible.

(MTH/195)

DISPOSAL WELL INSPECTION CHECKLIST

Permit # WDW 32Inspection Date(s) 3-20-95Section 6 EPA NO-MIGRATION PETITION APPROVAL CONDITIONS

1. Is the operator disposing of more waste volume than is allowed in the petition conditions? YES NO

Petition Value 750 gal/minObserved Value 717 gal Time Period per minute

2. Is the operator's waste stream complying with the specific gravity or density conditions of the petition? YES NO

Petition Value or Range 1.10Observed Value or Range 1.0026 Date(s) August, 1994

3. Is the operator disposing of any hazardous waste that has a waste code that is not included in the petition condition list of approved waste codes? YES NO

List wastes being disposed that aren't on the approved list:

Comments:

Note: If the answer to any of the above questions is the bolded answer, this means that the operator may be out of compliance with the EPA approved no-migration petition and the EPA needs to be notified of this situation as soon as possible.

(P.M. 11/95)

Well 5-14

DISPOSAL WELL INSPECTION CHECKLIST

Permit # WDW 14Inspection Date(s) 3-20-95Section 6 EPA NO-MIGRATION PETITION APPROVAL CONDITIONS

1. Is the operator disposing of more waste volume than is allowed in the petition conditions? YES NO

Petition Value 750 gal/minObserved Value N/A gal Time Period _____
SEE COMMENT

2. Is the operator's waste stream complying with the specific gravity or density conditions of the petition? YES NO

Petition Value or Range 1.10Observed Value or Range N/A SEE COMMENT Date(s) _____

3. Is the operator disposing of any hazardous waste that has a waste code that is not included in the petition condition list of approved waste codes? YES NO

List wastes being disposed that aren't on the approved list:

Comments:

Well was out of service at the time of inspection

Note: If the answer to any of the above questions is the bolded answer, this means that the operator may be out of compliance with the EPA approved no-migration petition and the EPA needs to be notified of this situation as soon as possible.

44

UIC

DISPOSAL WELL INSPECTION CHECKLIST

Permit # WDW 49Inspection Date(s) March 31, April 15, 91TWC Inspector(s) Nadia Hamed
(Print)District 07Permittee Name Hoechst Celanese Company Well # 4Inspection Type: Regular
Facility Type: CommercialFollow up
Non-commercialCompany Reps/Guides
Kaymartha WilliamsTitle
Environmental EngineerPhone
409-241-4123Section 1 PRE-INJECTION FACILITIES

1. Are facilities managing hazardous wastes? *Interim Status tanks waiting for an exemption as a totally enclosed treatment system.* Yes No NA
2. Facilities covered under RCRA Permit? *treatment system.* Yes No NA
3. Are facilities exempted from permitting requirements? Yes No NA
4. Description of preinjection facilities *Preinjection facilities consist of Storage vessel V-680, two neutralization vessels 1216 and 1217 Primary filters V-1061, V-1062, V-1059 and V-1060 Polishing filters V-162, V-163, V-656, V-657, V-758 and V-757 and surge vessel*
5. Evidence of leaks or spills? (If yes, note in comments) Yes No NA
6. In the permit for this facility, are the 31 TAC Chapter 331 rules incorporated by reference? Yes No NA

Note to the inspector: If the answer to the above question is "No", then only the provisions specifically stated in the permit are required to be met. In these cases any reference for a potential violation must cite the permit provision, not the rules.

Section 2 UIC FACILITIESCOMPLIANT?

1. Is a legible sign with company name, company well number and TWC permit number posted at the well site? *TAC 331.66(a)(1)* Yes No NA
2. Is an all weather road to the well installed and maintained? *TAC 331.66(a)(2)* Yes No NA
3. Is wellhead painted (if appropriate), maintained in good working order, without leaks? *TAC 331.66(a)(3)* Yes No NA
4. Whenever the well is operating, are trained staff on location and able to operate the well and respond to alarms? *TAC 331.64(c)(2)* Yes No NA

Note: All noncompliances must include comments.

(Revised 10/1/91)

ADDENDUM I

TEXAS WATER COMMISSION

Paul Hopkins, Chairman
Ralph Roming, Commissioner
John O. Houchins, Commissioner



Larry R. Soward, Executive Director
Mary Ann Hefner, Chief Clerk
James K. Rourke, Jr., General Counsel

January 20, 1987

Celanese Chemical Company
P.O. Box 509
Bay City, Texas 77414

RE: Amendment to Permit No. WDW-49

Dear Sirs:

Enclosed is a copy of the referenced permit issued pursuant to your application and Chapter 26 of the Texas Water Code. The permit constitutes an official document which should be kept in your permanent records.

Please continue using the self-reporting forms you have on hand until new forms are forwarded by the Water Quality Division.

Should you have any questions, please contact us.

Very truly yours,

TEXAS WATER COMMISSION

By Mary Ann Hefner
Mary Ann Hefner
Chief Clerk

MAH:lm
Enclosures
cc w/enclosure:

TWC District No. 12
Plant Manager, Celanese Chemical Company

PERMIT NO. WDW-49



TEXAS WATER COMMISSION
Stephen F. Austin State Office Building
Austin, Texas

This permit supersedes and replaces TWC Permit No. WDW-49 issued April 8, 1969 and amended September 15, 1972.

PERMIT to conduct underground injection under provisions of Chapter 26 & 27, Texas Water Code (for hazardous waste disposal wells) and Article 4477-7, Texas Solid Waste Disposal Act

I. Name of Permittee:

A. Name Celanese Chemical Company

B. Address P. O. Box 509
 Bay City, Texas 77414

II. Type of Permit: Regular _____ Amended

III. Nature of Business: Petro-chemical Plant

IV. General Description and Location of Injection Activity

The injection well will be used to dispose of industrial waste from the Bay City Plant. The well is located 3489 feet north and 2442 feet east of the southwest corner of the company property which is located on the James Moore League,

CONTINUED on Pages 2 through 8.

The permittee is authorized to conduct injection activity in accordance with limitations, requirements, and other conditions set forth herein. This permit is granted subject to the rules and orders of the Commission, and the laws of the State of Texas. This permit is valid for a period of 10 years or until amended or revoked by the Commission.

APPROVED, ISSUED AND EFFECTIVE this 13th day of January, 1987.

ATTEST:

Mary Ann Steiner

Pam Hopkins
For the Commission

Celanese Chemical Company, Inc.

Abstract No. 62, Matagorda County, Texas, approximately 10 miles southwest of Bay City, Texas; 28°21'24" North latitude, 96°00'59" West longitude. Injection will be into the Miocene sands in the approximate subsurface interval between 3300 and 3700 feet.

V. Construction Requirements

A permit for the drilling and operation of this disposal well was issued on April 8, 1969. The permittee set and cemented surface casing to a subsurface depth of 1389 feet, and long-string casing from the surface into the injection zone to 3162 feet to properly protect usable quality ground water. Cementing was by the pump and plug method. Cement was circulated outside both casings back to the surface. Except as specifically required in terms of the original permit, construction of the well and the associated facilities was done in accordance with the plans and specifications contained in the permit application. Any proposed changes to the plans and specifications must be certified in writing by the Executive Director that said changes provide equivalent or greater protection than the original design criteria and standards. Any change in well operational parameters will require a permit amendment as specified in 31 TAC Section 305.62.

VI. Character of the Waste Streams

- A. Industrial waste permitted to be injected shall consist of the following waste streams; however, wastes not authorized to be stored, processed or handled in associated solid waste surface facilities are expressly not authorized.
 1. Wastes generated during closure of the well and associated facilities that are compatible with permitted wastes and the reservoir.
 2. Wastes associated with the production of Acetaldehyde, Vinyl Acetate, n-Butyl Alcohol, n-Propyl Alcohol, Iso-Butyl Alcohol, Heptanoic Acid, Nonanoic Acid, Hydrogen Synthesis Gas, C₇ and C₉ Aldehydes, Propionic Acid, and Fatty Alcohols.
 3. Contaminated rainfall runoff, slab wash water, contaminated products, contaminated raw materials, tank car heels, and spillage and wash water from tank car-tank truck cleaning and loading areas.

E. The pH and density of the injected waste shall be monitored continuously or on a batch basis or by grab sample once every 8 hours. Annulus volumes shall be monitored a minimum once each work shift.

F. Mechanical integrity was demonstrated on November 30, 1983 and shall be demonstrated thereafter once every five years for the life of the well.

IX. Reporting Requirements

A. The permittee shall submit to the Commission within twenty (20) days after the last day of March, June, September and December of each year a Report of Injection Operation on forms supplied by the Commission.

B. The permittee shall submit to the Commission annually, with the December operating report, an acceptable report of the pressure effects of the well upon its injection zone, including a direct measurement of bottom-hole pressure, or a calculation of bottom-hole pressure using the specific gravity of fluid in the wellbore and the static fluid level. To the extent such information is reasonably available, the report shall also include:

1. Locations of newly constructed and discovered wells within the Area of Review if such wells were not included in the Technical Report accompanying the permit application or in later reports.

2. A tabulation of data for all newly constructed and discovered wells within 1/2 mile of the injection well and for all such wells within the Area of Review that penetrate to within 300 feet of the top of the injection zone as required by 31 TAC Section 331.65(b) (2) (B).

3. Annual injection fluid analysis.

C. The permittee shall notify the Austin Office of the Commission within twenty-four (24) hours of any change in monitoring parameters or of any other observations which could reasonably be attributed to a leak or other failure in well equipment.

D. The permittee shall submit to the Commission within forty-five (45) days after completion of the following tests a report including both data and interpretation of the results of:

1. Periodic tests of mechanical integrity; and
2. Any other test of the injection well or injection zone if required by the Executive Director.

X. Well Workovers

- A. The permittee shall notify the Austin Office of the Commission of any workover or corrective maintenance operation:
1. For major workovers or corrective maintenance operations which involve removal of injection tubing the permittee shall obtain approval of the Executive Director prior to beginning work. Notification shall be in writing and shall include plans for the proposed work. The Executive Director may grant an exception to prior written notification when immediate action is required.
 2. For other workovers or corrective maintenance operations the permittee shall notify the Austin Office of the Commission and obtain approval before beginning work.
- B. Within sixty (60) days after completion of any workover, a completion report shall be submitted to the Commission including the reason for the well workover and details of the work performed.
- C. During major workovers, the bottom-hole pressure shall be determined either by direct measurement using conventional techniques or by calculation using specific gravity of fluid in the wellbore and the static fluid level.
- D. All phases of any workover shall be supervised by a person knowledgeable and experienced in practical well engineering, who is familiar with the special conditions and requirements of injection well construction and operation.
- E. Mechanical integrity shall be demonstrated following major workovers or corrective maintenance operations which involve removal of injection tubing or perforating.

XI. Plugging

- A. Upon final abandonment the well shall be plugged in accordance with plans and specifications contained in the

application after mechanical integrity of the well is verified by a program approved by the Executive Director. Any proposed changes to plans and specifications must be certified in writing by the Executive Director that said changes provide protection equivalent to or greater than the original design criteria and standards.

- B. The permittee shall notify the Austin Office of the Commission in writing thirty (30) days prior to commencing plugging operations. Within thirty (30) days of completion of plugging operations the permittee shall submit to the Austin Office of the Commission a plugging report on forms provided by the Commission.
- C. The permittee shall secure and maintain in full force and effect at all times a performance bond or other form of financial security, in accordance with 31 TAC Section 305.153 (relating to Financial Responsibility), to provide for proper plugging and abandonment of the permitted waste disposal well. The bond or other form of financial security shall be in the amount of \$79,000.00. The amount of financial security may, at the discretion of the Texas Water Commission, be altered at a future date to provide for adequate plugging subject to prevailing general economic conditions, as provided by 31 TAC Section 305.62 (pertaining to the amendment of permits). The injection of fluids is not authorized until the permittee secures the performance bond or other form of financial security as described above.

XII. Monitoring and Record Keeping

- A. The permittee shall keep complete and accurate records of:
 1. All monitoring required in the permit, including:
 - a. Continuous records of surface injection pressures,
 - b. Continuous records of the tubing-long string annulus pressures,
 - c. Continuous records of injection flow rates,
 - d. Monthly total volume of injected fluids,
 - e. Annulus volume,
 - f. Injection fluid pH,
 - g. Injection fluid density,
 2. All periodic well tests, including but not limited to:

- a. Injection fluid analysis,
 - b. Bottom-hole pressure readings,
 - c. Mechanical integrity.
3. All shut-in periods and times that emergency measures were used for handling waste; and
 4. Any additional information on conditions that might reasonably affect the operation of the injection well.
- B. All records shall be made available for review upon request from a representative of the Commission.
 - C. The permittee shall retain, for a period of five (5) years following abandonment, records of all information resulting from any monitoring activities or records required by this permit.

XIV. Other Requirements

- A. A sign shall be posted at the well site which shall show the name of the company, company well number and permit number. The sign and identification shall be in the English language, clearly legible and shall be in numbers and letters at least one (1) inch high.
- B. An all-weather road shall be installed and maintained to allow access to the disposal well and related facilities.
- C. The wellhead and associated facilities shall be painted, where appropriate, and maintained in good working order without leaks.
- D. The following rules are incorporated in this permit by reference:

Permit Characteristics and Conditions,
31 TAC Subchapter F, Sections 305.121-128
Additional Conditions for Injection Well Permits,
31 TAC Subchapter H, Sections 305.151-160

- E. No discharge of wastes, other than those waste streams specified in Paragraph VI of this permit injected into Miocene Sands in the subsurface between approximately 3300 and 3700 feet is authorized by this permit from this facility into water in the State.

- F. Within thirty (30) days after permit approval, the permittee shall provide written notice to the Executive Director that a copy of the permit has been filed with the health and pollution control authorities of the county, city or town where the well is located.
- G. All solid waste managed at the facility shall be managed in accordance with 31 TAC Chapter 335, Rules for Industrial Solid Waste and Municipal Hazardous Waste.
- H. The permittee is subject to the provisions of 31 TAC 305.125.

Compliance Summary
WDW-14, 32, 49, and 110

Celanese Chemical Co., Inc. has operated waste disposal wells at their Bay City facility since 1964. Their present wells were issued permits on September 28, 1964 for WDW-14, July 3, 1967 for WDW-32, April 8, 1969 for WDW-49 and March 27, 1973 for WDW-110. Annual inspections and self reporting through the years have generally revealed a compliant operation with only an occasional problem with instrument calibration, chart inking, or inadequate annulus pressure. One serious mechanical integrity problem which developed with WDW-110 in 1984 resulted in a compliance agreement with Celanese so that the problem could be resolved as expeditiously as possible. The terms of the agreement were achieved in a timely manner. Celanese is viewed overall to have a compliant, conscientious operation.

Joseph L. Peters 8/20/86

Joseph L. Peters, Hydrologist
Ground Water Conservation Section

TEXAS WATER COMMISSION

Page 1 of 1

DISPOSAL WELL INSPECTION CHECKLIST

Permit # WDW 32,49, + 110 Inspection Date(s) March 31, April 15,**Section 6 EPA NO-MIGRATION PETITION APPROVAL CONDITIONS**

1. Is the operator disposing of more waste volume than is allowed in the petition conditions ? YES NO

Petition Value 26,784,000 galObserved Value 7,231,700 gal Time Period August

2. Is the operator's waste stream complying with the specific gravity or density conditions of the petition ? YES NO

Petition Value or Range 1.00 to 1.10Observed Value or Range 1.0045 Date(s) April 15, 93

3. Is the operator disposing of any hazardous waste that has a waste code that is not included in the petition condition list of approved waste codes ? YES NO

List wastes being disposed that aren't on the approved list:

Comments:

Note: If the answer to any of the above questions is the bolded answer, this means that the operator may be out of compliance with the EPA approved no-migration petition and the EPA needs to be notified of this situation as soon as possible.

John Hall, Chairman
Pam Reed, Commissioner
Peggy Garner, Commissioner



TEXAS WATER COMMISSION

PROTECTING TEXANS' HEALTH AND SAFETY BY PREVENTING AND REDUCING POLLUTION

May 14, 1993

Ms. Kaymartha Williams
Environmental Engineer
Hoechst Celanese Chemical Group
P.O. Box 509
Bay City, TX 77404

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

RE: Hoechst Celanese, S. W. Registration No. 30134
WDW-14, WDW-32, WDW-49, WDW-110
EPA ID No. TXD026040709
Underground Injection Control Violations

□ Dear Ms. Williams:

□ On March 31 and April 15, 1993, a representative of the Texas Water Commission (TWC) District 7 office conducted an inspection of the above referenced facility. The inspection was conducted to determine the facility's compliance with the commission's rules pertaining to Underground Injection Control (UIC). During the inspection, conditions were observed and documented that we believe constitute a violation of the UIC rules. The following area of alleged violation was observed.

Permit Provision VIII.E. - Operating Parameters

□ The pH and density of the injected waste shall be monitored continuously or on a batch basis or by grab sample once every 8 hours. Annulus volumes shall be monitored a minimum once each work shift.

○ It was noted in the inspection that the facility was measuring the fluid density once every 12 hours (i.e once per shift) for the wells above.

Concerning this alleged violation, we request your response in writing with a schedule for corrective action by June 14, 1993. We also request that you advise us of any corrective action which you have already taken.

An on-site inspection or review of records will be conducted at the appropriate time to verify compliance. Failure to respond within the requested time frame and to adequately remedy UIC violations may result in the initiation of formal enforcement action which could lead

REPLY TO: DISTRICT 7 / 5144 E. SAM HOUSTON PARKWAY N. / HOUSTON, TEXAS 77015 / AREA CODE 713/457-5191

Ms. Kaymartha Williams
Page -2-
May 14, 1993

to administrative penalties of up to \$10,000 per day assessed against the company by the Texas Water Commission.

A copy of the 31 TAC Chapter 331 regulations can be obtained for a fee from Agency Information Consultants, Inc., P. O. Box 2181, Austin, Texas 78768, telephone number 512/478-8991 or from Research and Planning Consultants, 3200 Red River St., Suite 302, Austin, TX 78705, telephone number 512/327-0009. The Code of Federal Regulations (40 CFR Parts 260-299) is available from the U. S. Government Printing Office, Texas Crude Building, 801 Travis Street, Houston, TX 77002, telephone number 713/228-1187 or from the U.S. Government Printing Office, Room 1C-50, Federal Building, 1100 Commerce Street, Dallas, TX 75242, telephone number 214/767-0076.

② If you have any questions regarding these matters, please contact Ms. Nadia Hameed of the District 7 Office at telephone number 713/457-5191.

② Sincerely,

②

Susan D. Bredehoeft
Susan D. Bredehoeft

Program Manager

② Industrial & Hazardous Waste Program
District 7 - Houston

② SDB/NH/tl

②

②

Texas Water Commission

INTEROFFICE MEMORANDUM

To: FILE

Date: May 14, 1993

Thru: Ben Wesley, UIC Coordinator, Program Services Unit
Field Operations Division

From: Nadia Hameed, Field Investigator
District 7 - Houston

Subject: Hoechst Celanese - Permit No. WDW-32, WDW-49 and WDW-110
TWC Registration No. 30134
Underground Injection Control Inspection
Conducted March 31 and April 15, 1993

I. INTRODUCTION

On March 31 and April 15, 1992, Nadia Hameed of the Texas Water Commission (TWC) District 7 office conducted an Underground Injection Control (UIC) inspection at the above referenced facility. Participating in the inspection on behalf of Hoechst Celanese was Kaymartha Williams.

II. WASTES GENERATED

The facility has three injection wells (WDW-110, WDW-32, WDW-49) for the disposal of non-hazardous wastewaters. The waste being deep well injected in these wells consists mainly of non-hazardous wastewaters including tank car wash effluent. The wastewaters and other non-hazardous waste is routed through the oil/water separators to a non-hazardous storage tank #680. From tank #680 the waste is sent to two neutralization vessels 1216 and 1217 to be pH adjusted.

III. WASTE MANAGEMENT FACILITIES

Once the pH has been adjusted the waste is put through primary filters V-1061, V-1062, V-1059 and V-1060 and then through polishing filters V-162, V-163, V-656, V-657, V-758 and V-757. It is then sent into surge vessel V-159 prior to being sent to one of the three non-hazardous deep wells for injection.

The pH is continuously monitored by pH meters and the permit requires that the fluid density be checked at least once every 8 hours.

File
Page -2-
May 14, 1993

Workover has just been completed on WDW-110 where the Lower Miocene injection interval that was used to receive hazardous waste has just been closed. As a result WDW-110 will no longer be used for hazardous waste injection.

IV. VIOLATION

- o The facility is required by the Permit Provision VIII. E. to measure the fluid density every 8 hours. It was noted in the inspection that the facility was measuring the fluid density once every 12 hours (i.e once per shift) for all of the wells above.

This information is submitted as file data.

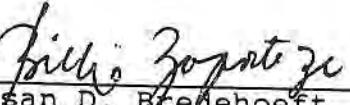
Signed:



Nadia Hameed
Field Investigator

Approved:

for


Susan D. Bredehoeft
Program Manager
Industrial and Hazardous Waste Program
District 7 - Houston

SDB/NH/tl

TWC DISTRICT 07

14

TWC:

30134

P

INSPECTION COVER SHEET

RCRA PERMITTED FACILITIES

HW Permit: 50153EPA ID#: TX D026040709

Name of Company: Hoechst Celanese Chemical Group Bay City
 Mailing Address: P.O. Box 509, Bay City, TX 77404
 Site Address: 10 miles Southwest of Bay City in Hwy 3057
 County: Matagovda Type of Industry: Petrochemical
Manufacturing

C.O. Use only

GEN/FAC. CLASSIFICATION: Industrial Municipal FACILITY CLASSIFICATION: Government Commercial OPERATIONAL STATUS : Active

Current Waste Management:

Generator	<u>I, II, III, IV</u>
Treatment	<u>I, II, III</u>
Storage	<u>H, I, III, II</u>
Disposal	<u>H, I, II, III</u>
Transporter	<u>H, I, II, III</u>
Pending Notification and Waste Determination	<u>-</u>

SEP 20 1993

H = HazardousI = Class I Non-hazardousII = Class II Non-haz.III = Class III Non-haz.C

HW Permitted P (circle codes):

<input type="radio"/> C	<input type="radio"/> T	<input checked="" type="radio"/> SI	<input type="radio"/> WP	<input type="radio"/> LT	<input checked="" type="radio"/> LP	<input type="radio"/> I	<input type="radio"/> TT	<input type="radio"/> TR	<input checked="" type="radio"/> WDR
<input type="radio"/> C	<input type="radio"/> T	<input checked="" type="radio"/> SI	<input type="radio"/> WP	<input type="radio"/> LT	<input checked="" type="radio"/> LP	<input type="radio"/> I	<input type="radio"/> TT	<input type="radio"/> TR	<input checked="" type="radio"/> WDR
<input type="radio"/> C	<input type="radio"/> T	<input type="radio"/> SI	<input type="radio"/> WP	<input type="radio"/> LT	<input checked="" type="radio"/> LP	<input type="radio"/> I	<input type="radio"/> TT	<input type="radio"/> TR	<input checked="" type="radio"/> WDR

HW Interim St. Fac. (circle):

HW Permit-Exempt Facilities : SA

NO FACILITIES (circle codes):
(double circle if permitted)

y6

TYPE OF INSPECTION (circle) : CEI SPL NRR CME CSE CDI OAM CAO

OTH (+ reason)

04 = complaint	06 = closure insp.
22 = SPL results	34 = UIC insp.
46 = DOD insp	50 = multi-media In
61 = state fee bill insp.	

Inspector's Name and Title Nadia Hamid, Field InvestigatorInspection Participants Kay Martha Williams, Environmental EngineerDate(s) of Inspection March 31, 93 April 15, 93
(begin) (end)Signed: R. Clark May 10, 93 Approved: Julie Zegartze 5/13/93
(date) (date)
for Susan Bradehoff 11/91

TEXAS WATER COMMISSION

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UIC

DISPOSAL WELL INSPECTION CHECKLIST

Permit # WDW 14

Inspection Date(s)

March 31

April 15, 93

TWC Inspector(s) Nadia Haneed
(Print)District 07Permittee Name Hoechst Celanese Company Well # 2Inspection Type: Regular
Facility Type: CommercialFollow up
Non-commercialCompany Reps/Guides
Kay Martha WilliamsTitle
Environmental EngineerPhone
409-241-4123Section 1 PRE-INJECTION FACILITIES

1. Are facilities managing hazardous wastes? These are interim Status tanks which Yes No NA
2. Facilities covered under RCRA Permit? are waiting for an exemption as a totally enclosed treatment system Yes No NA
3. Are facilities exempted from permitting requirements? Yes No NA
4. Description of preinjection facilities Preinjection facilities consist of:
Two Storage Tanks 1210 and 1211, Two neutralization Tanks - V-693 and V-1224
Primary filters V-151 and V-150, Polishing Filters V-152, V-153, V-662, V-663
and a surge tank V-1226.
5. Evidence of leaks or spills? (If yes, note in comments) Yes No NA
6. In the permit for this facility, are the 31 TAC Chapter 331 rules incorporated by reference? Yes No NA

Note to the inspector: If the answer to the above question is "No", then only the provisions specifically stated in the permit are required to be met. In these cases any reference for a potential violation must cite the permit provision, not the rules.

Section 2 UIC FACILITIESCOMPLIANT?

1. Is a legible sign with company name, company well number and TWC permit number posted at the well site? TAC 331.66(a)(1) Yes No NA
2. Is an all weather road to the well installed and maintained? TAC 331.66(a)(2) Yes No NA
3. Is wellhead painted (if appropriate), maintained in good working order, without leaks? TAC 331.66(a)(3) Yes No NA
4. Whenever the well is operating, are trained staff on location and able to operate the well and respond to alarms? TAC 331.64(c)(2) Yes No NA

Note: All noncompliances must include comments.

(Revised 10/1/91)

TEXAS WATER COMMISSION

Page 2 of 5

UIC

DISPOSAL WELL INSPECTION CHECKLIST

Permit # WDW 14Inspection Date(s) March 31, + April 15,Section 2 UIC FACILITIES (continued)

	<u>GAUGE</u>	<u>RECORDER</u>	<u>PERMIT LIMIT</u>	<u>COMPLIANT?</u>
5. Inj. Pressure <i>TAC 331.63(a); 331.64(b); 331.64(c)</i>	<u>510</u>	<u>510</u>	<u>900</u> psig	<input checked="" type="radio"/> Yes No NA
6. Annulus Pressure <i>TAC 331.64(b); 331.64(c)</i>	<u>720</u>	<u>702</u>	<u>-</u> psig	<input checked="" type="radio"/> Yes No NA
7. Differential Press. <i>TAC 331.63(c)</i>	<u>210</u>	<u>192</u>	<u>min 100</u> psi	<input checked="" type="radio"/> Yes No NA
8. Injection Rate <i>TAC 331.63(d); 331.64(c)</i>	(red)	<u>200</u>	<u>750</u> gpm (max)	<input checked="" type="radio"/> Yes No NA
9. Inj. Fluid Temperature <i>TAC 331.64(c)</i>	(blue)	<u>104</u> °F		Yes No <input checked="" type="radio"/> NA

	<u>VALUE</u>	<u>HOW MEASURED</u>	<u>PERMIT LIMIT</u>	<u>COMPLIANT?</u>
10. pH <i>TAC 331.63(f)</i>	<u>7.05</u>	<u>Strip Chart</u>	<u>5.0</u> Min	<input checked="" type="radio"/> Yes No NA
11. Fluid Density <i>TAC 331.63(f)</i>	<u>1.007</u>	<u>Grab</u>	<u>1.10</u> Max	<input checked="" type="radio"/> Yes No NA

12. Are annulus fluid volume continuous recorders used?
TAC 331.62(d)(4); 331.64(c)

13. Are injection fluids sampled and analyzed sufficiently to yield representative data about characteristics?
TAC 331.64(a); 331.65(b)(3)(C); 331.67(a)(2)(A)

14. Are gauges installed and maintained in proper working order at all times? *TAC 331.64(b)*

15. Are recorders installed and maintained in proper working order at all times? *TAC 331.64(c)*

16. Are recorders and other required instruments housed in weatherproof enclosures? *TAC 331.64(c)*

17. Are Automatic alarms and shutoff devices installed and operational? (Auto shutoff not required if owner/operator certifies to TWC that trained operators are always present when well is operating.) *TAC 331.64(c)(1)*

18. Are quarterly corrosion monitoring tests performed and recorded? *TAC 331.64(f)(1)*

19. Are all gauges, pressure sensing and recording devices tested and calibrated quarterly? *TAC 331.63(e)*

Note: All noncompliances must include comments.

(Revised 10/1/91)

UIC

TEXAS WATER COMMISSION

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DISPOSAL WELL INSPECTION CHECKLIST

Permit # WDW 14Inspection Date(s) March 31, April 15, 9Section 3 RECORDS REVIEWCOMPLIANT?

1. Are self reported data submitted as required by permit and rules? *TAC 331.65(b)(1) or 331.65(b)(2)* Yes No NA
2. Are complete and accurate records maintained as required by permit and rules? *TAC 331.67(a), (b) and (c)* Yes No NA
3. Are records available for review by Commission representative? *TAC 331.67(b)* Yes No NA
4. Are all records retained throughout the life of the well? *TAC 331.67(c)* Yes No NA
5. Has an injection zone annual report been submitted with December self reported data? *TAC 331.65(b)(3)* Yes No NA
6. Did permittee notify TWC and get approval before beginning any well workovers that require taking well out of service? *TAC 331.63(g)* Yes No NA
7. Was mechanical integrity test performed following any well workovers? *TAC 331.63(h)* Yes No NA
8. Has an annual mechanical integrity test been performed? *TAC 331.64(d)* Yes No NA

Date of last MIT

Dec 1, 1992

Due date of next MIT

Dec 1993

9. Has an annual pressure falloff test been performed? *TAC 331.64(g)(2)* Yes No NA
10. Does permittee currently have sufficient financial assurance to meet permit requirements? Amount of financial security required by permit \$ 82,000.00 Yes No NA
11. Does permittee comply with land disposal restriction regulations for UIC wells? *40CFR part 148* Yes No NA

Section 4 ABANDONED WELLS

1. Is a permanent marker with permit number, date abandoned, and company name placed at the plugged well? *TAC 331.46(k)* Yes No NA
2. Are all required monitoring parameters for abandoned wells performed and reported? *TAC 331.46, 331.68* Yes No NA
3. Are all records retained for 5 years after abandonment? Yes No NA

Note: All noncompliances must include comments.

(Revised 10/1/91)

TEXAS WATER COMMISSION

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UIC

DISPOSAL WELL INSPECTION CHECKLIST

Permit # WDW 14Inspection Date(s) March 31, April 5, 9Section 5 SELF REPORTED DATA-RECORDS REVIEW

NOTE: Complete one page per monthly review of records

1. Review of self reported data for October, 1992 (month, year)

	<u>REPORTED VALUE</u>	<u>OBSERVED VALUE</u>	<u>PERMIT LIMIT</u>	<u>COMPLIANT?</u>
2. Max. Inj. Pressure <u>331.63(a); 331.64(b),(c); 331.67(a)(1)(A)</u>	<u>514</u>	<u>518</u>	<u>900</u> psig	<input checked="" type="radio"/> Yes No NA
3. Min. Annulus Press <u>TAC 331.64(b),(c); 331.67(a)(1)(B)</u>	<u>620</u>	<u>620</u>	<u>N/A</u> psig	<input checked="" type="radio"/> Yes No NA
4. Min. Differential <u>TAC 331.63(c)</u>	<u>48</u>	<u>146</u>	<u>100</u> psi	<input checked="" type="radio"/> Yes No NA
5. Max. Injection Rate <u>331.63(d); 331.64 (c); 331.67(a)(1)(C)</u>	<u>205</u>	<u>206</u>	<u>750</u> gpm	<input checked="" type="radio"/> Yes No NA
6. Average Inj. Rate			<u>N/A</u> gpm	<input checked="" type="radio"/> Yes No NA
7. Total Injection Vol. <u>TAC 331.67(a)(1)(D)</u>	<u>8.7941</u>	<u>8.79</u>	<u>55448</u> gal million	<input checked="" type="radio"/> Yes No NA
8. Minimum pH <u>TAC 331.63(f)</u>	<u>6.55</u>	<u>6.55</u>	<u>5.0</u> SU	<input checked="" type="radio"/> Yes No NA
9. Max. Fluid Density <u>TAC 331.63(f)</u>	<u>1.0075</u>	<u>1.0075</u>	<u>1.00</u>	<input checked="" type="radio"/> Yes No NA
10. Inj. Fluid Temp. <u>TAC 331.64(c)</u>	<u>N/A</u>	<u>N/A</u>		<input checked="" type="radio"/> Yes No NA
11. Other Permit Param.	<u>N/A</u>	<u>N/A</u>		<input checked="" type="radio"/> Yes No NA

(Pen Colors and Conversion Factors (optional))

C

Comments

The facility is required by permit provision VIII.E to measure fluid density every 8 hours. It was noted in the inspection that the facility was only measuring the fluid density every 12 hours. This is a violation of the above permit provision.

(Use additional comment sheet if necessary)

Lead Inspector Nadia Haneed Sign N. Haneed Date May 10, 1993 Print

Note: All noncompliances must include comments.

(Revised 10/1/91)

DISPOSAL WELL INSPECTION CHECKLIST

Permit # WDW 14Inspection Date(s) March 31, April 15, 93**Section 6 EPA NO-MIGRATION PETITION APPROVAL CONDITIONS**

1. Is the operator disposing of more waste volume than is allowed in the petition conditions ?

Petition Value 33,480,000 gal cumulative for 14, 32 + 49.

Observed Value 8,794 (WDW-14) gal Time Period October
3,5712 (WDW-32)
5,0443 (WDW-49)

TOTAL 17,4095

2. Is the operator's waste stream complying with the specific gravity or density conditions of the petition ?

Petition Value or Range 1.00 65 1.1

Observed Value or Range 1.007 Date(s) April 15, 93

3. Is the operator disposing of any hazardous waste that has a waste code that is not included in the petition condition list of approved waste codes ?

List wastes being disposed that aren't on the approved list:

Comments:

Note: If the answer to any of the above questions is the bolded answer, this means that the operator may be out of compliance with the EPA approved no-migration petition and the EPA needs to be notified of this situation as soon as possible.

ADDENDUM I

TEXAS WATER COMMISSION

Paul Hopkins, Chairman
Ralph Roming, Commissioner
John O. Houchins, Commissioner

Larry R. Soward, Executive Director
Mary Ann Hefner, Chief Clerk
James K. Rourke, Jr., General Counsel

January 20, 1987

Celanese Chemical Company, Inc.
P.O. Box 509
Bay City, Texas 77414

RE: Amendment to Permit No. WDW-14

Dear Sirs:

Enclosed is a copy of the referenced permit issued pursuant to your application and Chapter 26 of the Texas Water Code. The permit constitutes an official document which should be kept in your permanent records.

Please continue using the self-reporting forms you have on hand until new forms are forwarded by the Water Quality Division.

Should you have any questions, please contact us.

Very truly yours,

TEXAS WATER COMMISSION

By 
Mary Ann Hefner
Chief Clerk

MAH:lm
Enclosures
cc w/enclosure:
TWC District No. 12
Plant Manager, Celanese Chemical Company

PERMIT NO. WDW-14



TEXAS WATER COMMISSION
Stephen F. Austin State Office Building
Austin, Texas

This permit supersedes and replaces TWC Permit No. WDW-14 issued September 18, 1964 and amended on June 28, 1965 and September 15, 1972.

PERMIT to conduct underground injection under provisions of Chapter 26 & 27, Texas Water Code (for hazardous waste disposal wells) and Article 4477-7, Texas Solid Waste Disposal Act

I. Name of Permittee:

A. Name Celanese Chemical Company, Inc.

B. Address P. O. Box 509
Bay City, Texas 77414

II. Type of Permit: Regular _____ Amended

III. Nature of Business: Petro-chemical Plant

IV. General Description and Location of Injection Activity

The injection well will be used to dispose of industrial waste from the Bay City Plant. The well is located 5230 feet south and 2220 feet west of the most northerly northwest corner of the company property which is located on the

CONTINUED on Pages 2 through 8.

The permittee is authorized to conduct injection activity in accordance with limitations, requirements, and other conditions set forth herein. This permit is granted subject to the rules and orders of the Commission, and the laws of the State of Texas. This permit is valid for a period of 10 years or until amended or revoked by the Commission.

APPROVED, ISSUED AND EFFECTIVE this 13th day of January, 19 87.

ATTEST:

Mary Ann Steiner *Paul Hopkins*
For the Commission

James Moore League, Abstract No. 62, Matagorda County, Texas, approximately 10 miles southwest of Bay City, Texas; 28°51'19" North latitude, 96°01'15" West longitude. Injection will be into the Miocene sands in the approximate subsurface interval between 3300 and 3700 feet.

V. Construction Requirements

A permit for the drilling and operation of this disposal well was issued on September 28, 1964. The permittee set and cemented surface casing to a subsurface depth of 1,369 feet, and long-string casing from the surface into the injection zone to 3,750 feet to properly protect usable quality ground water. Cementing was by the pump and plug method. Cement was circulated outside both casings back to the surface. Except as specifically required in terms of the original permit, construction of the well and the associated facilities was done in accordance with the plans and specifications contained in the permit application. Any proposed changes to the plans and specifications must be certified in writing by the Executive Director that said changes provide equivalent or greater protection than the original design criteria and standards. Any change in well operational parameters will require a permit amendment as specified in 31 TAC Section 305.62.

VI. Character of the Waste Streams

A. Industrial waste permitted to be injected shall consist of the following waste streams; however, wastes not authorized to be stored, processed or handled in associated solid waste surface facilities are expressly not authorized.

1. Wastes generated during closure of the well and associated facilities that are compatible with permitted wastes and the reservoir.
2. Wastes associated with the production of Acetaldehyde, Vinyl Acetate, n-Butyl Alcohol, n-Propyl Alcohol, Iso-Butyl Alcohol, Heptanoic Acid, Nonanoic Acid, Hydrogen, Synthesis Gas, C₇ and C₉ Aldehydes, Propionic Acid, and Fatty Alcohols.
3. Contaminated rainfall runoff, slab wash water, contaminated products, contaminated raw materials, tank car heels, and spillage and wash water from tank car-tank truck cleaning and loading areas.

4. Wastes normally injected into WDW-110, when it is out of service for workover, provided that the pH of injected fluids is adjusted to be no less than 5.0.
- B. The pH of injected waste streams shall not be less than 5.0.
- C. Except as authorized by the Executive Director for purposes of performing a workover or shutting in the well, the density of injected fluids shall not exceed a specific gravity of 1.10.

VII. Injection Rates and Volumes

- A. The combined maximum instantaneous rate of injection into this well, WDW-32 and WDW-49 shall not exceed 750 gallons per minute.
- B. The cumulative volume of wastewater injected into this well, WDW-32 and WDW-49 shall not exceed 33,480,000 gallons per month. (Based on 750 gals/min. and a 31 day month)
- C. The cumulative volume of wastewater injected into this well, WDW-32 and WDW-49 shall not exceed 394,200,000 gallons per year. (Based on 750 gals/min. and 365 days)

VIII. Operating Parameters

- A. The operating surface injection pressure shall not exceed 900 psig.
- B. The tubing-long string casing annulus shall be filled with a corrosion inhibiting fluid. A positive pressure with a differential from injection pressure of at least 100 psi shall be maintained on the annulus to detect well malfunctions. Instrumentation shall be installed to detect well malfunctions by both annulus pressure changes and annulus volume changes.
- C. Pressure gauges shall be installed and maintained in proper operating conditions at all times on the injection tubing and tubing-long string casing annulus at the wellhead.
- D. Continuous recording devices shall be installed and maintained in proper operating conditions at all times to record injection tubing pressure, injection flow rate, injection volumes and tubing-long string casing annulus pressure. The instruments shall be housed in weatherproof enclosures.

Grab samples ~~hour~~
every 12 hrs?
every 8 hours
every 1 hour?

- E. The pH and density of the injected waste shall be monitored continuously or on a batch basis or by grab sample once every 8 hours. Annulus volumes shall be monitored a minimum once each work shift.
- F. Mechanical integrity was demonstrated on December 1, 1983 and shall be demonstrated thereafter once every five years for the life of the well.

IX. Reporting Requirements

- A. The permittee shall submit to the Commission within twenty (20) days after the last day of March, June, September and December of each year a Report of Injection Operation on forms supplied by the Commission.
- B. The permittee shall submit to the Commission annually, with the December operating report, an acceptable report of the pressure effects of the well upon its injection zone, including a direct measurement of bottom-hole pressure, or a calculation of bottom-hole pressure using the specific gravity of fluid in the wellbore and the static fluid level. To the extent such information is reasonably available, the report shall also include:
1. Locations of newly constructed and discovered wells within the Area of Review if such wells were not included in the Technical Report accompanying the permit application or in later reports.
 2. A tabulation of data for all newly constructed and discovered wells within 1/2 mile of the injection well and for all such wells within the Area of Review that penetrate to within 300 feet of the top of the injection zone as required by 31 TAC Section 331.65(b) (2) (B).
 3. Annual injection fluid analysis.
- C. The permittee shall notify the Austin Office of the Commission within twenty-four (24) hours of any change in monitoring parameters or of any other observations which could reasonably be attributed to a leak or other failure in well equipment.
- D. The permittee shall submit to the Commission within forty-five (45) days after completion of the following tests a report including both data and interpretation of the results of:

1. Periodic tests of mechanical integrity; and
2. Any other test of the injection well or injection zone if required by the Executive Director.

X. Well Workovers

- A. The permittee shall notify the Austin Office of the Commission of any workover or corrective maintenance operation:
 1. For major workovers or corrective maintenance operations which involve removal of injection tubing the permittee shall obtain approval of the Executive Director prior to beginning work. Notification shall be in writing and shall include plans for the proposed work. The Executive Director may grant an exception to prior written notification when immediate action is required.
 2. For other workovers or corrective maintenance operations the permittee shall notify the Austin Office of the Commission and obtain approval before beginning work.
- B. Within sixty (60) days after completion of any workover, a completion report shall be submitted to the Commission including the reason for the well workover and details of the work performed.
- C. During major workovers, the bottom-hole pressure shall be determined either by direct measurement using conventional techniques or by calculation using specific gravity of fluid in the wellbore and the static fluid level.
- D. All phases of any workover shall be supervised by a person knowledgeable and experienced in practical well engineering, who is familiar with the special conditions and requirements of injection well construction and operation.
- E. Mechanical integrity shall be demonstrated following major workovers or corrective maintenance operations which involve removal of injection tubing or perforating.

XI. Plugging

- A. Upon final abandonment the well shall be plugged in accordance with plans and specifications contained in the application after mechanical integrity of the well is verified by a program approved by the Executive Director. Any proposed changes to plans and specifications must be certified in writing by the Executive Director that said changes provide protection equivalent to or greater than the original design criteria and standards.
- B. The permittee shall notify the Austin Office of the Commission in writing thirty (30) days prior to commencing plugging operations. Within thirty (30) days of completion of plugging operations the permittee shall submit to the Austin Office of the Commission a plugging report on forms provided by the Commission.
- C. The permittee shall secure and maintain in full force and effect at all times a performance bond or other form of financial security, in accordance with 31 TAC Section 305.153- (relating to Financial Responsibility), to provide for proper plugging and abandonment of the permitted waste disposal well. The bond or other form of financial security shall be in the amount of \$82,000.00. The amount of financial security may, at the discretion of the Texas Water Commission, be altered at a future date to provide for adequate plugging subject to prevailing general economic conditions, as provided by 31 TAC Section 305.62 (pertaining to the amendment of permits). The injection of fluids is not authorized until the permittee secures the performance bond or other form of financial security as described above.

XII. Monitoring and Record Keeping

- A. The permittee shall keep complete and accurate records of:
 1. All monitoring required in the permit, including:
 - a. Continuous records of surface injection pressures,
 - b. Continuous records of the tubing-long string annulus pressures,
 - c. Continuous records of injection flow rates,
 - d. Monthly total volume of injected fluids,
 - e. Annulus volume,

- f. Injection fluid pH,
 - g. Injection fluid density,
2. All periodic well tests, including but not limited to:
 - a. Injection fluid analysis,
 - b. Bottom-hole pressure readings,
 - c. Mechanical integrity.
 3. All shut-in periods and times that emergency measures were used for handling waste; and
 4. Any additional information on conditions that might reasonably affect the operation of the injection well.
- B. All records shall be made available for review upon request from a representative of the Commission.
- C. The permittee shall retain, for a period of five (5) years following abandonment, records of all information resulting from any monitoring activities or records required by this permit.

XIV. Other Requirements

- A. A sign shall be posted at the well site which shall show the name of the company, company well number and permit number. The sign and identification shall be in the English language, clearly legible and shall be in numbers and letters at least one (1) inch high.
- B. An all-weather road shall be installed and maintained to allow access to the disposal well and related facilities.
- C. The wellhead and associated facilities shall be painted, where appropriate, and maintained in good working order without leaks.
- D. The following rules are incorporated in this permit by reference:

Permit Characteristics and Conditions,
31 TAC Subchapter F, Sections 305.121-128
Additional Conditions for Injection Well Permits,
31 TAC Subchapter H, Sections 305.151-160

- E. No discharge of wastes, other than those waste streams specified in Paragraph VI of this permit injected into the Miocene Sands in the subsurface between approximately 3300 and 3700 feet is authorized by this permit from this facility into water in the State.
- F. Within thirty (30) days after permit approval, the permittee shall provide written notice to the Executive Director that a copy of the permit has been filed with the health and pollution control authorities of the county, city or town where the well is located.
- G. All solid waste managed at the facility shall be managed in accordance with 31 TAC Chapter 335, Rules for Industrial Solid Waste and Municipal Hazardous Waste.
- H. The permittee is subject to the provisions of 31 TAC 305.125.

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Texas Water Commission

INTEROFFICE MEMORANDUM

To: FILE

Date: May 14, 1993

Thru: Ben Wesley, UIC Coordinator, Program Services Unit
Field Operations Division

From: Nadia Hameed, Field Investigator
District 7 - Houston

Subject: Hoechst Celanese - Permit No. WDW-14
TWC Registration No. 30134
Underground Injection Control Inspection
Conducted March 31 and April 15, 1993

I. INTRODUCTION

On March 31 and April 15, 1993, Nadia Hameed of the Texas Water Commission (TWC) District 7 office conducted an Underground Injection Control (UIC) inspection at the above referenced facility. Participating in the inspection on behalf of Hoechst Celanese was Kaymartha Williams.

II. WASTES GENERATED

The facility is presently only using one deep well WDW-14 for hazardous waste injection. The wastes sent into this well primarily originate from the acetaldehyde unit. These consist mainly of K009 and K010, listed wastes and any makeup water from the acetaldehyde unit. In addition the well is approved to dispose of D001, D002, U001, U002, U031, U112, U123, U140, U154, U197, U226, F001, F002 and hexavalent chromium.

III. WASTE MANAGEMENT FACILITIES

The pre-injection facilities mainly consist of:

Two storage tanks 1210 and 1211, where the waste is stored initially. From here it is sent to two neutralization tanks V-693 and V-1224 and then it is routed via primary filters V-151 and V-150 and polishing filters V-152, V-153, V-662 and V-663 to surge tank V-1226 and then into the deep well.

Presently these tanks that are associated with this system are interim status tanks. The facility, however, has applied

File
Page -2-
May 14, 1993

to the TWC for an exemption of these tanks from RCRA regulation as they consider these tanks to be part of a totally enclosed system. No decision has yet been reached.

IV. VIOLATION

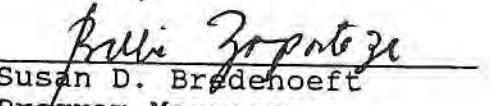
- o The facility is required by the Permit Provision VIII. E. to measure the fluid density every 8 hours. It was noted in the inspection that the facility was measuring the fluid density once every 12 hours (i.e once per shift) for the well above.

This information is submitted as file data.

-
- signed:


Nadia Hameed
Field Investigator

-
- Approved:


for Susan D. Bredehoeft
Program Manager
Industrial and Hazardous Waste Program
District 7 - Houston

-
- SDB/NH/tl

TWC DISTRICT 07

WDW-32

TWC 30/34

INSPECTION COVER SHEET

P
RCRA PERMITTED FACILITIESHW Permit: 50153EPA ID#: TX D026040709

Name of Company: Hoechst Celanese Chemical Group Bay City
 Mailing Address: P.O. Box 509 Bay City TX 77404
 Site Address: 10 miles Southwest of Bay City on Hwy 357
 County: Matagorda Type of Industry: Petrochemical Manufacturing

C.O. Use only

GEN/PAC. CLASSIFICATION: Industrial Municipal FACILITY CLASSIFICATION: Government Commercial OPERATIONAL STATUS: Active

Current Waste Management:

Generator	<u>H, I III, II</u>
Treatment	<u>I, H, II</u>
Storage	<u>H, I, III, II</u>
Disposal	<u>H, I, II, III</u>
Transporter	
Pending Notification	
and Waste Determination	

H = HazardousI = Class I Non-hazardousII = Class II Non-haz.III = Class III Non-haz.

**

H W Permitted P (circle codes):

<input type="circle"/> C	<input type="circle"/> T	<input type="circle"/> SI	<input type="circle"/> WP	<input type="circle"/> LT	<input type="circle"/> LP	<input type="circle"/> I	<input type="circle"/> TT	<input type="circle"/> TR	<input type="circle"/> WDR
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H W Interim St. Pac. (circle):

<input type="circle"/> C	<input type="circle"/> T	<input type="circle"/> SI	<input type="circle"/> WP	<input type="circle"/> LT	<input type="circle"/> LP	<input type="circle"/> I	<input type="circle"/> TT	<input type="circle"/> TR	<input type="circle"/> WDR
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H W Permit-Exempt Facilities: SA

<input type="circle"/> C	<input type="circle"/> T
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N HCFACILITIES (circle codes):
(double circle if permitted)

<input type="circle"/> C	<input type="circle"/> T	<input type="circle"/> SI	<input type="circle"/> WP	<input type="circle"/> LT	<input type="circle"/> LF	<input type="circle"/> I	<input type="circle"/> TT	<input type="circle"/> TR	<input type="circle"/> WDR
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TYPE OF INSPECTION (circle) : CEI SPL NRR CME CSE CDI OAM CAO

OTH (+ reason)

04 = complaint 06 = closure insp.
 22 = SPL results 34 = UIC insp. WDW-110, 32
 46 = DOD insp 50 = multi-media In +49
 61 = state fee bill insp.

Inspector's Name and Title Kadia Hamid, field InvestigatorInspection Participants Kay Martha Williams, Environmental EngineerDate(s) of Inspection March 31, 93
(begin)April 15, 93
(end)Signed: N. HenneMay 10, 93 Approved:
(date)Beth Zagorska 5/13/93
for Susan Bredehoef
(date)

11/91

UIC

TEXAS WATER COMMISSION

Page 1 of 4

DISPOSAL WELL INSPECTION CHECKLIST

Permit # WDW 32

Inspection Date(s)

March 31, April 15, 9TWC Inspector(s) Nadia Haneed
(Print)District 07Permittee Name Hoechst CelaneseCompany Well # 3Inspection Type: Regular
Facility Type: CommercialFollow up
Non-commercial

Company Reps/Guides

Kaymartha Williams

Title

Environmental EngineerPhone 409-241-4123Section 1 PRE-INJECTION FACILITIES

1. Are facilities managing hazardous wastes? Yes No NA
2. Facilities covered under RCRA Permit? The tanks are interim status and are waiting for the approval or an exemption from RCRA Yes No NA
3. Are facilities exempted from permitting requirements? Yes No NA
4. Description of preinjection facilities Preinjection facilities consist of:
Storage vessel V-680, two neutralization vessels 1216 and 1217
Primary filter V-1061, V-1062, V-1059 and V-1060
Polishing filters V-162, V-163, V-656, V-657, V-758 and V-759
Evidence of leaks or spills? (If yes, note in comments) Yes No NA
5. In the permit for this facility, are the 31 TAC Chapter 331 rules incorporated by reference? Yes No NA

Note to the inspector: If the answer to the above question is "No", then only the provisions specifically stated in the permit are required to be met. In these cases any reference for a potential violation must cite the permit provision, not the rules.

Section 2 UIC FACILITIESCOMPLIANT?

1. Is a legible sign with company name, company well number and TWC permit number posted at the well site? TAC 331.66(a)(1) Yes No NA
2. Is an all weather road to the well installed and maintained? TAC 331.66(a)(2) Yes No NA
3. Is wellhead painted (if appropriate), maintained in good working order, without leaks? TAC 331.66(a)(3) Yes No NA
4. Whenever the well is operating, are trained staff on location and able to operate the well and respond to alarms? TAC 331.64(c)(2) Yes No NA

Note: All noncompliances must include comments.

(Revised 10/1/91)

TEXAS WATER COMMISSION

Page 2 of 4

UIC

DISPOSAL WELL INSPECTION CHECKLIST

Permit # WDW 32Inspection Date(s) March 31, April 15,Section 2 UIC FACILITIES (continued)

	<u>GAUGE</u>	<u>RECORDER</u>	<u>PERMIT LIMIT</u>	<u>COMPLIANT?</u>
5. Inj. Pressure TAC 331.63(a); 331.64(b); 331.64(c)	<u>345</u>	<u>320</u>	<u>900</u> psig	<input checked="" type="radio"/> Yes No NA
6. Annulus Pressure TAC 331.64(b); 331.64(c)	<u>530</u>	<u>516</u>	<u>—</u> psig	<input checked="" type="radio"/> Yes No NA
7. Differential Press. TAC 331.63(c)	<u>185</u>	<u>196</u>	<u>Min 100</u> psi	<input checked="" type="radio"/> Yes No NA
8. Injection Rate TAC 331.63(d); 331.64(c)	(Red)	<u>73</u>	<u>750</u> gpm (max)	<input checked="" type="radio"/> Yes No NA
9. Inj. Fluid Temperature TAC 331.64(c)		<u>92</u> °F		<input checked="" type="radio"/> Yes No NA

	<u>VALUE</u>	<u>HOW MEASURED</u>	<u>PERMIT LIMIT</u>	<u>COMPLIANT?</u>
10. pH TAC 331.63(f)	<u>7.2</u>	<u>Strip Chart</u>	<u>5.0 min</u>	<input checked="" type="radio"/> Yes No NA
11. Fluid Density TAC 331.63(f) (8a-)	<u>1.0045</u>	<u>Grab</u>	<u>1.10 max.</u>	<input checked="" type="radio"/> Yes No NA
12. Are annulus fluid volume continuous recorders used? TAC 331.62(d)(4); 331.64(c)				<input checked="" type="radio"/> Yes No NA
13. Are injection fluids sampled and analyzed sufficiently to yield representative data about characteristics? TAC 331.64(a); 331.65(b)(3)(C); 331.67(a)(2)(A)				<input checked="" type="radio"/> Yes No NA
14. Are gauges installed and maintained in proper working order at all times? TAC 331.64(b)				<input checked="" type="radio"/> Yes No NA
15. Are recorders installed and maintained in proper working order at all times? TAC 331.64(c)				<input checked="" type="radio"/> Yes No NA
16. Are recorders and other required instruments housed in weatherproof enclosures? TAC 331.64(c)				<input checked="" type="radio"/> Yes No NA
17. Are Automatic alarms and shutoff devices installed and operational? (Auto shutoff not required if owner/operator certifies to TWC that trained operators are always present when well is operating.) TAC 331.64(c)(1)				<input checked="" type="radio"/> Yes No NA
18. Are quarterly corrosion monitoring tests performed and recorded? TAC 331.64(f)(1)				<input checked="" type="radio"/> Yes No NA
19. Are all gauges, pressure sensing and recording devices tested and calibrated quarterly? TAC 331.63(e)				<input checked="" type="radio"/> Yes No NA

Note: All noncompliances must include comments.

(Revised 10/1/91)

UIC

TEXAS WATER COMMISSION

Page 3 of 4

DISPOSAL WELL INSPECTION CHECKLIST

Permit # WDW 32Inspection Date(s) March 31, April 15, 91Section 3 RECORDS REVIEWCOMPLIANT?

1. Are self reported data submitted as required by permit and rules? TAC 331.65(b)(1) or 331.65(b)(2) Yes No NA
2. Are complete and accurate records maintained as required by permit and rules? TAC 331.67(a), (b) and (c) Yes No NA
3. Are records available for review by Commission representative? TAC 331.67(b) Yes No NA
4. Are all records retained throughout the life of the well? TAC 331.67(c) Yes No NA
5. Has an injection zone annual report been submitted with December self reported data? TAC 331.65(b)(3) Yes No NA
6. Did permittee notify TWC and get approval before beginning any well workovers that require taking well out of service? TAC 331.63(g) Yes No NA
7. Was mechanical integrity test performed following any well workovers? TAC 331.63(h) Yes No NA
8. Has an annual mechanical integrity test been performed? TAC 331.64(d) Yes No NA

9. Date of last MIT Sept 16, 1992 Due date of next MIT Sept 16, 1993
 Yes Testing last done Nov 1989 Due Date - Nov 1993
 Has an annual pressure falloff test been performed? TAC 331.64(g)(2) Yes No NA

10. Does permittee currently have sufficient financial assurance to meet permit requirements? Amount of financial security required by permit \$82,000 Yes No NA
11. Does permittee comply with land disposal restriction regulations for UIC wells? 40CFR part 148 Yes No NA

Section 4 ABANDONED WELLS

1. Is a permanent marker with permit number, date abandoned, and company name placed at the plugged well? TAC 331.46(k) Yes No NA
2. Are all required monitoring parameters for abandoned wells performed and reported? TAC 331.46, 331.68 Yes No NA
3. Are all records retained for 5 years after abandonment? Yes No NA

Note: All noncompliances must include comments.

(Revised 10/1/91)

UIC

DISPOSAL WELL INSPECTION CHECKLIST

Permit # WDW 32Inspection Date(s) March 31, April 15Section 5 SELF REPORTED DATA-RECORDS REVIEW

NOTE: Complete one page per monthly review of records

1. Review of self reported data for December, 1992 (month, year)

	<u>REPORTED VALUE</u>	<u>OBSERVED VALUE</u>	<u>PERMIT LIMIT</u>	<u>COMPLIANT?</u>
2. Max. Inj. Pressure <i>TAC 331.63(a); 331.64(b), (c); 331.67(a)(1)(A)</i>	<u>666</u>	<u>66.6</u>	<u>900</u> psig	<input checked="" type="radio"/> Yes No NA
3. Min. Annulus Press <i>TAC 331.64(b), (c); 331.67(a)(1)(B)</i>	<u>260</u>	<u>260</u>	<u>N/A</u> psig	<input checked="" type="radio"/> Yes No NA
4. Min. Differential <i>TAC 331.63(c)</i>	<u>172</u>	<u>170</u>	<u>100</u> psi	<input checked="" type="radio"/> Yes No NA
5. Max. Injection Rate <i>331.63(d); 331.64 (c); 331.67(a)(1)(C)</i>	<u>159</u>	<u>159</u>	<u>750</u> gpm	<input checked="" type="radio"/> Yes No NA
6. Average Inj. Rate			<u>N/A</u> gpm	<input checked="" type="radio"/> Yes No NA
7. Total Injection Vol. <i>TAC 331.67(a)(1)(D)</i>	<u>3.8837</u>	<u>3.8838</u>	<u>33.48</u> million gal	<input checked="" type="radio"/> Yes No NA
8. Minimum pH <i>TAC 331.63(f)</i>	<u>6.25</u>	<u>6.25</u>	<u>5.0</u> SU See Comment	<input checked="" type="radio"/> Yes No NA
9. Max. Fluid Density <i>TAC 331.63(f)</i>	<u>1.0075</u>	<u>1.0075</u>	<u>1.100</u>	<input checked="" type="radio"/> Yes No NA
10. Inj. Fluid Temp. <i>TAC 331.64(c)</i>	<u>N/A</u>	<u>N/A</u>		<input checked="" type="radio"/> Yes No NA
11. Other Permit Param.	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<input checked="" type="radio"/> Yes No NA

Pen Colors and Conversion Factors (optional)

Comments

*pH is no longer a parameter for WDW - 32 that needs to be reported.**The facility is required by permit provision VIII.E to measure fluid density every 8 hours. It was noted in the inspection that the facility was only measuring fluid density every 12 hours. This is a violation of the above permit provision.*

(Use additional comment sheet if necessary)

Lead Inspector May 10, 93
Date

Sign

NADIA HAMEED
Print

PERMIT NO. WDW-32



TEXAS WATER COMMISSION
Stephen F. Austin State Office Building
Austin, Texas

This permit supersedes and replaces TWC Permit No. WDW-32 issued July 3, 1967 and amended on December 6, 1969 and September 15, 1972..

PERMIT to conduct underground injection under provisions of Chapter 26 & 27, Texas Water Code (for hazardous waste disposal wells) and Article 4477-7, Texas Solid Waste Disposal Act

I. Name of Permittee:

A. Name Celanese Chemical Company, Inc.

B. Address P. O. Box 509
 Bay City, Texas 77414

II. Type of Permit: Regular _____ Amended

III. Nature of Business: Petro-chemical Plant

IV. General Description and Location of Injection Activity

The injection well will be used to dispose of industrial waste from the Bay City Plant. The well is located 4292 feet south and 2029 feet west of the most northly northwest corner of the company property which is located on the James Moore League, Abstract No. 62, Matagorda County, Texas,

CONTINUED on Pages 2 through 8.

The permittee is authorized to conduct injection activity in accordance with limitations, requirements, and other conditions set forth herein. This permit is granted subject to the rules and orders of the Commission, and the laws of the State of Texas. This permit is valid for a period of 10 years or until amended or revoked by the Commission.

APPROVED, ISSUED AND EFFECTIVE this 13th day of January, 1987.

ATTEST,

Marylin Skye

Paul Hopkins
For the Commission

approximately 10 miles southwest of Bay City, Texas,
28°51'59" North latitude, 96°01'13" West longitude.
Injection will be into the Miocene sands in the approximate
subsurface interval between 3300 and 3700 feet.

V. Construction Requirements

A permit for the drilling and operation of this disposal well was issued on July 3, 1967. The permittee set and cemented surface casing to a subsurface depth of 1302 feet, and long-string casing from the surface into the injection zone to 3245 feet to properly protect usable quality ground water. Cementing was by the pump and plug method. Cement was circulated outside both casings back to the surface. Except as specifically required in terms of the original permit, construction of the well and the associated facilities was done in accordance with the plans and specifications contained in the permit application. Any proposed changes to the plans and specifications must be certified in writing by the Executive Director that said changes provide equivalent or greater protection than the original design criteria and standards. Any change in well operational parameters will require a permit amendment as specified in 31 TAC Section 305.62.

VI. Character of the Waste Streams

A. Industrial waste permitted to be injected shall consist of the following waste streams; however, wastes not authorized to be stored, processed or handled in associated solid waste surface facilities are expressly not authorized.

1. Wastes generated during closure of the well and associated facilities that are compatible with permitted wastes and the reservoir.
2. Wastes associated with the production of Acetaldehyde, Vinyl Acetate, n-Butyl Alcohol, n-Propyl Alcohol, Iso-Butyl Alcohol, Heptanoic Acid, Nonanoic Acid, Hydrogen Synthesis Gas, C₇ and C₉ Aldehydes, Propionic Acid, and Fatty Alcohols.
3. Contaminated rainfall runoff, slab wash water, contaminated products, contaminated raw materials, tank car heels, and spillage, and wash water from tank car-tank truck cleaning and loading areas.

4. Wastes normally injected into WDW-110, when it is out of service for workover, provided that the pH is adjusted to be no less than 5.0.
- B. The pH of injected waste streams shall not be less than 5.0.
- C. Except as authorized by the Executive Director for purposes of performing a workover or shutting in the well, the density of injected fluids shall not exceed a specific gravity of 1.10.

VII. Injection Rates and Volumes

- A. The combined maximum instantaneous rate of injection into this well, WDW-14 and WDW-49 shall not exceed 750 gallons per minute.
- B. The cumulative volume of wastewater injected into this well, WDW-14 and WDW-49 shall not exceed 33,480,000 gallons per month. (Based on 750 gals/min. and a 31 day month)
- C. The cumulative volume of wastewater injected into this well, WDW-14 and WDW-49 shall not exceed 394,200,000 gallons per year. (Based on 750 gals/min. and 365 days)

VIII. Operating Parameters

- A. The operating surface injection pressure shall not exceed 900 psig.
- B. The tubing-long string casing annulus shall be filled with a corrosion inhibiting fluid. A positive pressure with a differential from injection pressure of at least 100 psi shall be maintained on the annulus to detect well malfunctions. Instrumentation shall be installed to detect well malfunctions by both annulus pressure changes and annulus volume changes.
- C. Pressure gauges shall be installed and maintained in proper operating conditions at all times on the injection tubing and tubing-long string casing annulus at the wellhead.
- D. Continuous recording devices shall be installed and maintained in proper operating conditions at all times to record injection tubing pressure, injection flow rate, injection volumes and tubing-long string casing annulus pressure. The instruments shall be housed in weatherproof enclosures.

1 9 6 3 0 1 3 0 0 2 2

- E. The pH and density of the injected waste shall be monitored continuously or on a batch basis or by grab sample once every 8 hours. Annulus volumes shall be monitored a minimum once each work shift.
- F. Mechanical integrity was demonstrated on December 1, 1983 and shall be demonstrated thereafter once every five years for the life of the well.

IX. Reporting Requirements

- A. The permittee shall submit to the Commission within twenty (20) days after the last day of March, June, September and December of each year a Report of Injection Operation on forms supplied by the Commission.
- B. The permittee shall submit to the Commission annually, with the December operating report, an acceptable report of the pressure effects of the well upon its injection zone, including a direct measurement of bottom-hole pressure, or a calculation of bottom-hole pressure using the specific gravity of fluid in the wellbore and the static fluid level. To the extent such information is reasonably available, the report shall also include:
 1. Locations of newly constructed and discovered wells within the Area of Review if such wells were not included in the Technical Report accompanying the permit application or in later reports.
 2. A tabulation of data for all newly constructed and discovered wells within 1/2 mile of the injection well and for all such wells within the Area of Review that penetrate to within 300 feet of the top of the injection zone as required by 31 TAC Section 331.65(b) (2) (B).
 3. Annual injection fluid analysis.
- C. The permittee shall notify the Austin Office of the Commission within twenty-four (24) hours of any change in monitoring parameters or of any other observations which could reasonably be attributed to a leak or other failure in well equipment.
- D. The permittee shall submit to the Commission within forty-five (45) days after completion of the following tests a report including both data and interpretation of the results of:

1. Periodic tests of mechanical integrity; and
2. Any other test of the injection well or injection zone if required by the Executive Director.

X. Well Workovers

- A. The permittee shall notify the Austin Office of the Commission of any workover or corrective maintenance operation:
 1. For major workovers or corrective maintenance operations which involve removal of injection tubing the permittee shall obtain approval of the Executive Director prior to beginning work. Notification shall be in writing and shall include plans for the proposed work. The Executive Director may grant an exception to prior written notification when immediate action is required.
 2. For other workovers or corrective maintenance operations the permittee shall notify the Austin Office of the Commission and obtain approval before beginning work.
- B. Within sixty (60) days after completion of any workover, a completion report shall be submitted to the Commission including the reason for the well workover and details of the work performed.
- C. During major workovers, the bottom-hole pressure shall be determined either by direct measurement using conventional techniques or by calculation using specific gravity of fluid in the wellbore and the static fluid level.
- D. All phases of any workover shall be supervised by a person knowledgeable and experienced in practical well engineering, who is familiar with the special conditions and requirements of injection well construction and operation.
- E. Mechanical integrity shall be demonstrated following major workovers or corrective maintenance operations which involve removal of injection tubing or perforating.

XI. Plugging

- A. Upon final abandonment the well shall be plugged in accordance with plans and specifications contained in the

application after mechanical integrity of the well is verified by a program approved by the Executive Director. Any proposed changes to plans and specifications must be certified in writing by the Executive Director that said changes provide protection equivalent to or greater than the original design criteria and standards.

- B. The permittee shall notify the Austin Office of the Commission in writing thirty (30) days prior to commencing plugging operations. Within thirty (30) days of completion of plugging operations the permittee shall submit to the Austin Office of the Commission a plugging report on forms provided by the Commission.
- C. The permittee shall secure and maintain in full force and effect at all times a performance bond or other form of financial security, in accordance with 31 TAC Section 305.153 (relating to Financial Responsibility), to provide for proper plugging and abandonment of the permitted waste disposal well. The bond or other form of financial security shall be in the amount of \$82,000.00. The amount of financial security may, at the discretion of the Texas Water Commission, be altered at a future date to provide for adequate plugging subject to prevailing general economic conditions, as provided by 31 TAC Section 305.62 (pertaining to the amendment of permits). The injection of fluids is not authorized until the permittee secures the performance bond or other form of financial security as described above.

XII. Monitoring and Record Keeping

- A. The permittee shall keep complete and accurate records of:
 - 1. All monitoring required in the permit, including:
 - a. Continuous records of surface injection pressures,
 - b. Continuous records of the tubing-long string annulus pressures,
 - c. Continuous records of injection flow rates,
 - d. Monthly total volume of injected fluids,
 - e. Annulus volume,
 - f. Injection fluid pH,
 - g. Injection fluid density,
 - 2. All periodic well tests, including but not limited to:

- a. Injection fluid analysis,
 - b. Bottom-hole pressure readings,
 - c. Mechanical integrity.
3. All shut-in periods and times that emergency measures were used for handling waste; and
 4. Any additional information on conditions that might reasonably affect the operation of the injection well.
- B. All records shall be made available for review upon request from a representative of the Commission.
- C. The permittee shall retain, for a period of five (5) years following abandonment, records of all information resulting from any monitoring activities or records required by this permit.

XIV. Other Requirements

- A. A sign shall be posted at the well site which shall show the name of the company, company well number and permit number. The sign and identification shall be in the English language, clearly legible and shall be in numbers and letters at least one (1) inch high.
- B. An all-weather road shall be installed and maintained to allow access to the disposal well and related facilities.
- C. The wellhead and associated facilities shall be painted, where appropriate, and maintained in good working order without leaks.
- D. The following rules are incorporated in this permit by reference:

Permit Characteristics and Conditions,
31 TAC Subchapter F, Sections 305.121-128
Additional Conditions for Injection Well Permits,
31 TAC Subchapter H, Sections 305.151-160

- E. No discharge of wastes, other than those waste streams specified in Paragraph VI of this permit injected into Miocene sands in the subsurface between approximately 3300 and 3700 feet is authorized by this permit from this facility into water in the State.
- F. Within thirty (30) days after permit approval, the permittee shall provide written notice to the Executive

Director that a copy of the permit has been filed with the health and pollution control authorities of the county, city or town where the well is located.

- G. All solid waste managed at the facility shall be managed in accordance with 31 TAC Chapter 335, Rules for Industrial Solid Waste and Municipal Hazardous Waste.
- H. The permittee is subject to the provisions of 31 TAC 305.125.

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April 26, 1994
IOC-037-94

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City TX 77404-0509

CERTIFIED MAIL

Mr. Ben K. Knape - Head
UIC Team
UIC, Uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087

Subject: PRESSURE FALLOFF MECHANICAL INTEGRITY TESTING
(MIT) AND FALLOFF REPORT FOR WDW-14

Dear Mr. Knape:

Enclosed are two copies of the Pressure Falloff and MIT report for WDW-14 which are provided for your review and approval. As you are aware, the testing occurred between February 16th and February 22nd, 1994 and was performed by our Contractor, ECO Solutions, Inc., Houston, Texas.

Please don't hesitate to contact me at 409/241-4197 if you have comments and/or questions concerning the report.

Very truly yours,

I. O. Coleman, Jr./cjs

I. O. Coleman, Jr.
Environmental Section Leader

IOC/cjs
attachment

cc: Mr. Laurence G. Walker, Geologist
UIC Team
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, Texas 78711-3087

Mr. Phil Dellinger - **CERTIFIED MAIL - w/report**
Underground Injection Control Program
Environmental Protection Agency
1445 Ross Avenue, Suite #1200
Dallas, Texas 75202-2733

ECO Solutions, Inc.

**HOECHST CELANESE
CHEMICAL GROUP, INC.
Bay City Plant**

**PRESSURE FALLOFF AND
MECHANICAL INTEGRITY TESTING
FOR
WDW-14 (Well #2)**

Prepared by:

*ECO Solutions, Inc.
10333 Richmond, Suite 250
Houston, Texas 77042*

March 1994

Job No. 94-004

ECO Solutions, Inc.

Environmental Consulting and Technical Services

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1.0 INTRODUCTION AND EXECUTIVE SUMMARY

1.1 INTRODUCTION

Hoechst Celanese Chemical Group, Inc. (HCCG) contracted ECO Solutions, Inc. (ECO) to conduct bottom hole pressure falloff and mechanical integrity testing on WDW-14, HCCG's Class I injection well located at the Bay City, Texas facility. The attached report details the data and test results associated with that testing.

The following list provides an overview of the key elements of the testing:

- * A bottom hole pressure (BHP) falloff test was conducted to satisfy the annual mechanical integrity test requirements of the U.S. Environmental Protection Agency (EPA) and the Texas Natural Resource Conservation Commission (TNRCC).
- * An annulus pressure test was conducted to satisfy the annual mechanical integrity test requirements of the EPA and TNRCC.
- * A differential temperature survey was recorded to satisfy that portion of the 5-year mechanical integrity test requirement of the TNRCC.
- * A radioactive tracer survey was conducted to satisfy the annual requirements of the EPA and TNRCC.

The field operations were initiated on Wednesday, February 16th, 1994 and were completed on Tuesday, February 22nd, 1994. Mssrs. Reuben Alaniz and Robert Hall of ECO Solutions supervised the testing.

1.2 EXECUTIVE SUMMARY

WDW-14 was indefinitely taken out of service on February 22nd, 1994. The radioactive tracer survey conducted that day indicated a hole in the 9+5/8" protection casing 188' above the top of the permitted injection interval. Larry Walker of the TNRCC was on location while the survey was being conducted. The TNRCC and EPA, Region 6 were notified via

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telecommunications on February 23rd, and via written notification on February 25th (see Appendix J).

It should be noted that, with the exception of the hole in the casing, WDW-14 still has mechanical integrity in a conventional sense and is not an environmental risk. A review of the test and surveys conducted are listed below.

Radioactive Tracer Survey

The analysis of the radioactive tracer (RAT) survey demonstrated that no upward migration from the injection zone is occurring. However, the RAT did indicate a hole in the 9+5/8" protection casing at 3,168'. The hole is beneath the injection packer (see wellbore schematic) yet 188' above the top of the permitted injection interval at 3,350'.

The RAT survey indicated slight downward movement of fluids outside of the 9+5/8" protection casing from 3,168' - 3,212'. It does not appear that a significant amount of fluid has been injected out through the hole. This interpretation is also supported by the temperature survey that was conducted.

The RAT was witnessed by Mr. Larry Walker of the TNRCC and Robert Hall of ECO.

Differential Temperature Survey

The analysis of the differential temperature survey indicated no interformational transfer of fluids occurring behind the cemented protection casing from the top of the permitted interval back to the surface.

The differential temperature survey supports the RAT in regard to fluid movement through the hole. The differential temperature survey does not identify any thermal anomalies in the area of the hole in the protection casing at 3,168' that could be attributed to significant movements of fluid through the hole.

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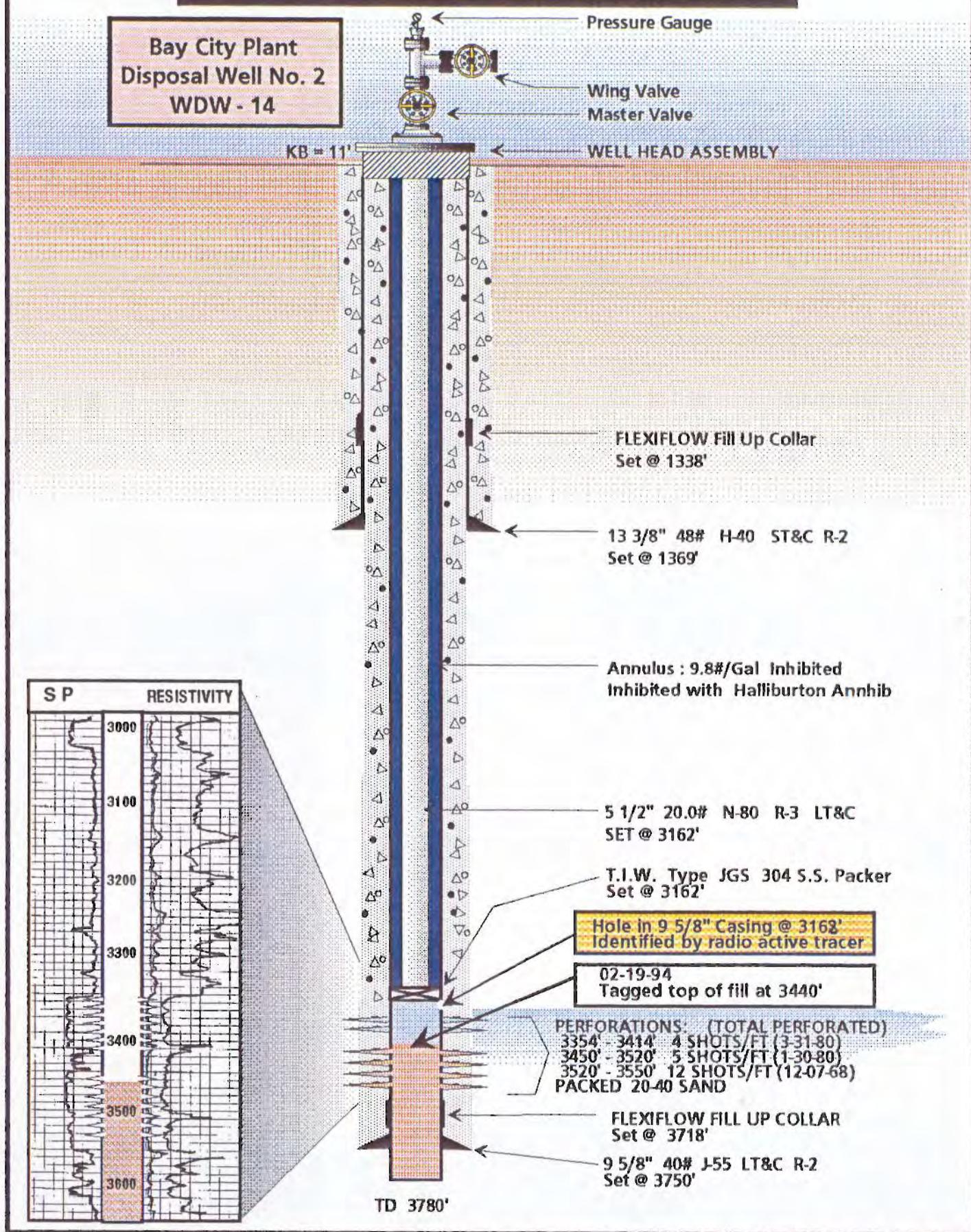
Annulus Pressure Test

A demonstration of a leak-free annulus was supported by an annulus pressure test (APT). The annulus was pressurized to 892.4 psig on February 21, 1994 for a one (1) hour test. The corresponding shut-in tubing pressure was 75.5 psig at the beginning of the test.

At the end of the test the annulus pressure had decreased to 886.6 psig with a corresponding shut-in tubing pressure of 75.8 psig. The total pressure loss of 5.8 psi is within the 5% pressure loss criteria set by the TNRCC.

FIGURE 1

HOECHST CELANESE CHEMICAL GROUP, INC.



HOECHST CELANESE CHEMICAL GROUP, INC. - WDW-14 (Well #2)

EVENT TIMELINE

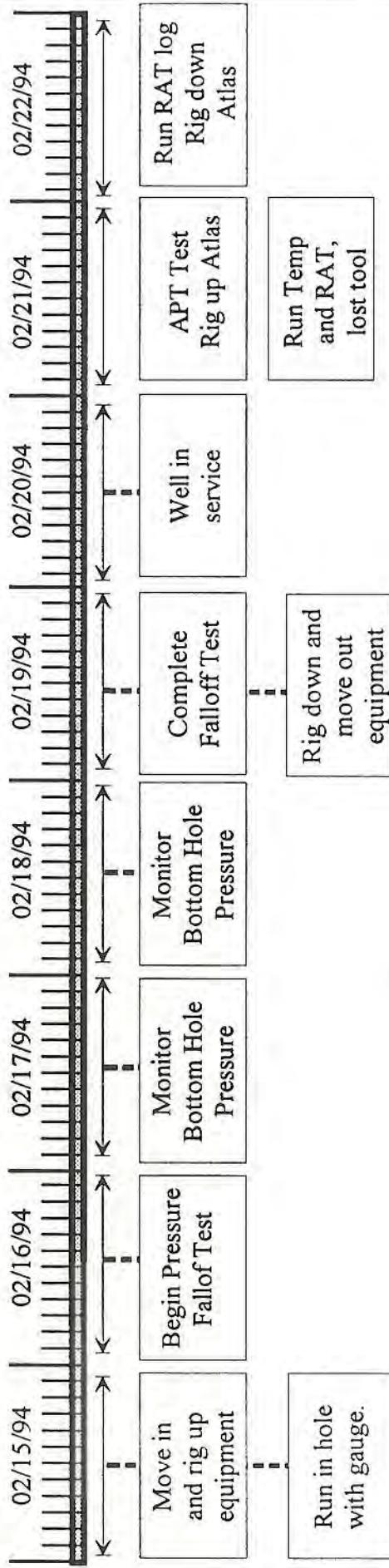


TABLE OF EVENTS

	Feb. 15, 1994	Feb. 16, 1994	Feb. 17, 1994	Feb. 18, 1994	Feb. 19, 1994	Feb. 20, 1994	Feb. 21, 1994	Feb. 22, 1994
Move in and rig up equipment.		Begin Pressure Falloff Test.	Monitor Bottom Hole Pressure.	Monitor Bottom Hole Pressure.	Complete Falloff Test.	No field operations.	Perform Annulus pressure test.	Run RAT log.
Run in hole with Panex gauge.								Rig down and move out equipment.
								Run RAT, lost tool in hole.

FIGURE 2

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Houston, Texas

2.0 SUMMARY OF FIELD OPERATIONS

Monday, February 14, 1994

A meeting was held with Ray Horton (Maintenance Engineer) to discuss and prepare for the fall-off test scheduled for February 16, 1994. Mr. Reuben Alaniz met with group leaders at the Utilities Department and discussed preparation for fall-off test. The subjects discussed were as follows:

- The shut-down of WDW-32 (Well #3) and WDW-110 (Well #1-A) prior to February 16.
- Shut-in points of Well #3 and Well 1-A, concerning pressure monitoring.
- Blind flange or slip flange injection line going into Well #2.
- Annulus Pressure test on Well #2 following fall-off.

Wednesday, February 16, 1994

Milton Cooke Wireline on location and began spotting equipment.

Reuben Alaniz met with Ray Horton and reviewed the proposed test procedures. Started rigging up on Well #2.

WDW-110 Well #1A	out of service	-	Monday, February 16, 1994.
WDW- 14 Well #2	maintain constant rate	-	Monday, February 16, 1994.
WDW- 32 Well #3	out of service	-	Monday, February 16, 1994.
WDW- 49 Well #4	out of service	-	July, 1993.

Begin GRC Data Acquisition System with GRC EPG-520 gauge (S/N 69491).

Pressured up lubricator with Surface Read Out and Memory Gauge back-up tool string. Adjusting wireline counter, prepared to go in hole.

Injection Rate WDW-14 (Well #2) 169 gpm
Surface Injection Pressure 480 psig
Surface Injection Temperature 92 Deg.F

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Going in hole with well injecting.

Injection Rate	169 gpm
Surface Injection Pressure	485 psig

Gauge lowered to test depth of 3,440 feet. Begin monitoring bottom hole injection pressure and temperature. A plant operator blocked valve by mistake and a corresponding pressure decrease was observed. The valve position was immediately corrected.

Monitoring WDW-14 (Well #14) injection period.

Injection Rate	169 gpm
Down hole Injection Pressure	1789 psia @ 3,440'
Surface Injection Pressure	480 psig

Thursday, February 17, 1994

Continue monitoring WDW-14 injection period.

Injection Rate	170 gpm
Down hole Injection Pressure	1788 psia @ 3,440'
Surface Injection Pressure	480 psig

Generate Cartesian curve to evaluate pressure stability.

Continue monitoring injection period.

Injection Rate	170 gpm
Down hole Injection Pressure	1789 psig @ 3,440'
Surface Injection Pressure	480 psig

Generate Cartesian curve to evaluate pressure stability.

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Friday, February 18, 1994

Continue monitoring WDW-14 injection period.

Injection Rate	169 gpm
Down hole Injection Pressure	1791 psia @ 3,440'
Surface Injection Pressure	485 psig

Generate Cartesian curve to evaluate pressure stability. Contact plant personal at Utilities control room to prepare for fall-off test.

Shut down Injection pump at Control room 1 and begin fall-off test.

Final Injection Rate	169 gpm
Final Down hole Injection Pressure	1790 psia @ 3,440'
Surface Injection Pressure	485 psig

Monitor fall-off period.

Down hole Shut-in Pressure	1580 psia @ 3,440'
Surface Shut-in Pressure	0 psig

Continue to monitor fall-off period.

Down hole Shut-in Pressure	1577 psia @ 3,440'
Surface Shut-in Pressure	78 psig

Generate semi-log and log-log curves for observation.

Saturday, February 19, 1994

Continue monitoring WDW-14 fall-off period.

Down hole Shut-in Pressure	1575 psia @ 3,440'
Surface Shut-in Pressure	74 psig

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Generate semi-log and log-log curves for observation. Prepare to end fall-off test.

End of WDW-14 fall-off test.

Down hole Shut-in Pressure	1575 psia @ 3,440'
Surface Shut-in Pressure	74 psig

Move tool downhole to tag bottom. Tagged fill at 3,440 ft. Began pulling out of hole making static gradient stops.

Gauges at surface, end of static gradient survey. Bleed down lubricator and rig down wireline.

Sunday, February 20, 1994

Well in service. No field operations.

Monday, February 21, 1994

All contractors went through the HCCG orientation at Plant Protection and then again down at the well. Larry Walker of the TNRCC on location to witness mechanical integrity testing.

HCCG personnel pressurized the annulus to 892.4 psig on February 21, 1994 for a one (1) hour test. The corresponding shut-in tubing pressure was 75.5 psig at the beginning of the one (1) hour test. At the end of the test the annulus pressure had decreased to 886.6 psig with a corresponding shut-in tubing pressure of 75.8 psig. Pressure test successful.

Atlas Wireline Services was rigged up to run temperature and radioactive tracer survey. Unable to get 1+11/16" logging tools through upper portion of wellhead. HCCG personnel removed same and bored out welded area extending into the inner diameter of wellhead.

Atlas logged differential wellbore temperatures from surface down to the top of fill at 3,443'. Atlas ran the API gamma-ray base log tie in log and two (2) gamma-ray base logs. The logging tools became lodged in the perforated interval and were pulled off the electric line before the Atlas operator could react to the situation (see Appendix K for logging tools left in hole). Pulled out of the hole. Closed well in for night (CWIFN).

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Tuesday, February 22, 1994

Western Atlas picked up additional logging tools this A.M. Atlas conducted the RAT as follows.

1. Ran API gamma-ray tie in strip.
2. Ran #1 base log from 3,348' to 2,776'.
3. Ran #2 base log from 3,348' to 2,776'.
4. Made multiple pass survey #1 with a radioactive slug ejected at 2,900' and a pump rate of 20 gpm.
5. Made multiple pass survey #2 with a radioactive slug ejected at 2,900' and a pump rate of 20 gpm.
6. Ran a stationary survey #1 at 3,342'. Watched slug pass tool and ran check for 15 minutes more. Pump rate was 50 gpm.
7. Ran a stationary survey #2 at 3,342'. Watched slug pass tool and ran check for 15 minutes more. Pump rate at 50 gpm.
8. Ran Gamma Ray base log after survey- repeated passes over "hot" spot at 3,168'.

"Hot" spot, apparent hole in protection casing, downward fluid movement indicated on log.

Pulled out of the hole and rigged down Western Atlas. Discussed same with Mr. Larry Walker of the TNRCC, decision made to close well in. CWIFN.

Wednesday, February 23, 1994

Tom Jones and Robert Hall of ECO met with HCCG personnel to discuss log analysis. Discussed same with Larry Walker of the TNRCC. Made additional notifications to TNRCC and USEPA Region 6 of HCCG's intent to take the well out of service for as yet an undefined time period.

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Rigged down and released Western Atlas.

Thursday, March 3, 1994

Move in and rig up B & G pump truck. Brined in WDW-14, 120 bbls of 9.8 ppg brine inhibited with Halliburton Anhib. Rigged down and released B & G.

3.0 PRESSURE FALLOFF TESTING AND ANALYSIS

3.1 PRESSURE FALLOFF TESTING

Pressure falloff testing commenced on February 16, 1994 and concluded on February 19, 1994. The flowing bottomhole pressure was monitored for a total of 49.38 hours followed by a twenty-four (24) hours shut-in period. The period of last shut-in was October 23 - 26, 1993 and a graphic presentation of injection versus days for this 115 day period is included as Figure 3. Plots and data for the test are included in Appendices A and B, respectively.

3.2 PRESSURE FALLOFF ANALYSIS

Method Of Interpretation: The following analysis was performed by utilizing both Semi-Log and Log-Log analysis. A) The *Semi-Log* curve was generated by plotting pressure vs the superposition time function utilizing the given rate history. The semi-log straight line was then calculated by linear regression through the infinite acting flow period of the falloff curve. The semi-log slope and P_{1hr} values were obtained from the semi-log straight line and utilized for the final permeability and skin calculations. B) The *Log-Log* curves were generated by plotting Delta-P/Delta-Q and Pressure derivative vs the Agarwal Equivalent time function. The Log-Log curves were simultaneously positioned over $[T_D/C_D]$ wellbore storage type-curves until a solution match was obtained. Permeability and skin values were calculated from this match and then compared with those obtained from the Semi-Log analysis.

- A. ***Semi-Log (Superposition):*** The straight line area of the semi-log curve was identified by first using the 1-1/2 log cycle rule to estimate the end of wellbore storage effects. Secondly, the time of the flat portion from the pressure derivative curve was used in determining the area of the semi-log curve in which the straight line was drawn. The semi-log straight line yielded a slope value of 5.0024 psi/cycle and a P_{1hr} of 1582 psi. The pressure difference between P_{1hr} and the injection pressure followed with the calculated slope would give indications of positive skin damage and high permeability.

- B. ***Log-Log ($[T_D/C_D]$ Wellbore storage Type-curves):*** The high maximum of the derivative curve illustrates wellbore storage and positive skin effects. The flattening portion of the derivative indicating the infinite acting flow period of the curve was observed

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approximately 1.8 hours following the start time of the falloff period. The flat portion of the derivative curve was the main factor used to obtain a type curve match yielding similar results to the semi-log analysis.

Conclusions: The system was diagnosed as a homogeneous reservoir with a calculated permeability of 1335 (md) and skin damage of +40.6 utilizing an h_{net} value of 210 feet. The flow efficiency of 21.5% suggests that the near wellbore conditions has large affects on the injection volume limitations and that the total pressure drop is primarily due to conditions within a small radius from the well.

The Following Table is provided to give comparative results with the previous test. The primary variables affecting the calculated results are included.

Date MM/YY	Rate GPM	h_{net} feet	U_w cp	Slope psi/cyl	kh/u md-ft	k md	S -
10/92	197	210	0.71	6.2000	177940	601.6	+ 23.7
02/94	169	210	1.49	5.0024	188184	1335.2	+ 40.6

The calculated results indicate a difference in transmissibility, (kh/u) of 5.4% and a difference in skin of 41.6% between the two tests. The increase in skin is most likely caused by the covering of the two bottom set of perforations (3450' - 3520' and 3520' - 3550'). The difference in the permeability values is due to the different viscosity values used in the calculations. The time to exit the waste front exceeded the start time of the infinite acting flow period, therefore the viscosity of the injection fluid was used for the analysis resulting in a much higher permeability value. However the transmissibility values are consistent between the two tests.

A homogeneous simulator was utilized to confirm the calculated results mentioned above. The main assumptions were as follows: a single well with infinite acting and radial flow conditions being injected at a constant rate with constant reservoir conditions such as porosity, permeability, and compressibility. Based on this particular reservoir the simulated data matched the actual data with a reasonable degree of accuracy.

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The program used for final analysis and well simulation was "PanSystem 2.1", marketed by Edinburgh Petroleum Services. Plots of the analysis using the "PanSystem 21" are included as Figures 4 - 8.

Table 3.1
Falloff Test Data - WDW-14 (Well #2)

1. General Test Information

Date of Test	February 16 - 19, 1994
Time since stabilized pressure (hrs.)	2721
Cumulative injection (gals.)	2402.35x10 ⁶ gallons
Wellbore radius (ft.)	0.45
Gross completed interval (ft.)	160'
Type of completion	Perforated
Depth to fill	3,440'
Justified interval thickness (ft.)	210'
Average historical waste fluid viscosity (cps)	1.49
Formation fluid viscosity (cps)	0.71
Porosity (%)	33
Total compressibility (psi ⁻¹)	5.0x10 ⁻⁶
Formation volume factor	1.0
Initial formation bottomhole pressure (psia) 1501 (1968) @ 3,300'	

2. Injection Period

Time of injection period (hrs.)	49.38
Injection rate (gallons per minute)	169
Test fluid	Waste Fluid
Pumps used for test	P61 Byron Jackson - Centrifugal
Injection fluid viscosity (cps)	1.49
Final injection pressure (psia)	1790.27
Final injection temperature (°F)	106.47
Gauge type	GRC EPG-520 Serial # 69491
Gauge resolution and calibration	0.01
Gauge depth (feet)	3,440

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3.

Falloff Period

Total Shut-in Time (hrs.)	24.42
Final Shut-in Pressure (psia)	1574.65
Final Shut-in Temperature °F	106.79
Final Shut-in Tubing Pressure (psia)	89

Table 3.2
Results of Analysis of Pressure Falloff Test
WDW-14 (Well #2)

	Semi-Log Superposition	Log-Log Type Curve	Semi-Log Synthesis
kh/ μ (md-ft/cp)	188,184	188,154	188,154
Flow capacity (md-ft)	280,394	280,350	280,350
Permeability (mds)	1335.93	1335.0	1335.0
Skin effect	40.58	41.0	40.6
Dimensionless storage coefficient			Cs = 0.108
p* (psia)	1564.32		

3.3 COMPARISON TO PETITION MODEL DATA

The reservoir properties (pressure, permeability, etc.) of the upper Miocene injection interval were determined through falloff testing conducted on WDW-14. The flowing or operational formation pressures from the tests can be compared with the modeled operational pressures by converting the measured pressures to a depth of 3440' below ground level and removing the pressure increase due to skin effect. The formation pressures predicted by the model assume no formation damage effects or other near-bore conditions. The measured flowing pressures corrected for skin effects and maximum predicted operational pressures are presented in the Table below:

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Formation Pressures WDW-14

Well Name	Flowing Formation Pressures, psi	Skin Pressure Loss, psi	Revised Formation Pressure, psi	Maximum Modeled Pressure, psi
WDW-14 (well 2)	1789	176	1613	1641

The measured flowing pressure is below the maximum modeled operational pressure by more than 28 psi for WDW-14. A graph of the modeled pressures for WDW-14 is included. The graph shows the yearly predicted modeled injection rates (250 gpm for each well). All predicted operational pressures correspond to a depth of 3440' below ground level and an original estimated formation pressure for the upper Miocene injection interval of 1555 psi.

The measured static formation pressures from the well tests, corrected to a depth of 3440' below ground level, show a formation pressure increase of 19 psi. This illustrates that injection operations at the plant have had limited impact on formation pressures and should continue to have limited impact on formation pressures in the future.

Static Formation Pressures From WDW-14 Well Test

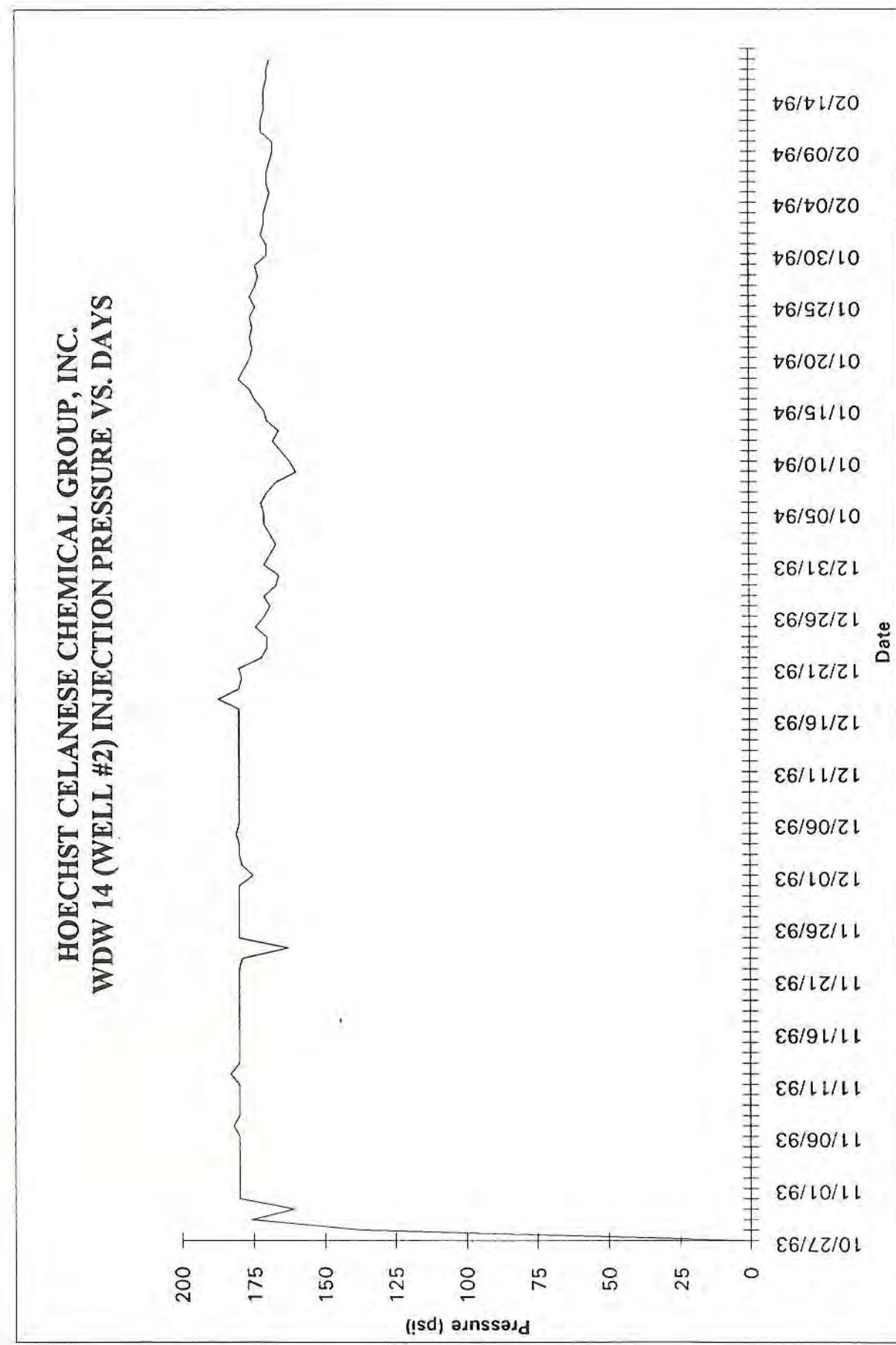
Well Name	Static Formation Pressure at 3440'	Formation Pressure Increase, psi
WDW-14 (Well 2)	1574	+19

A comparison of the test permeability and transmissivity values with the modeled values of permeability and transmissivity for WDW-14 are given below:

Well Name	Test Permeability, mds	Petition Permeability, mds	Test Transmissivity, md-ft/cp	Petition Transmissivity, mf-ft/cp
WDW-14 (well 2)	1335	1350	188,184	313,700

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FIGURE 3



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Report File:

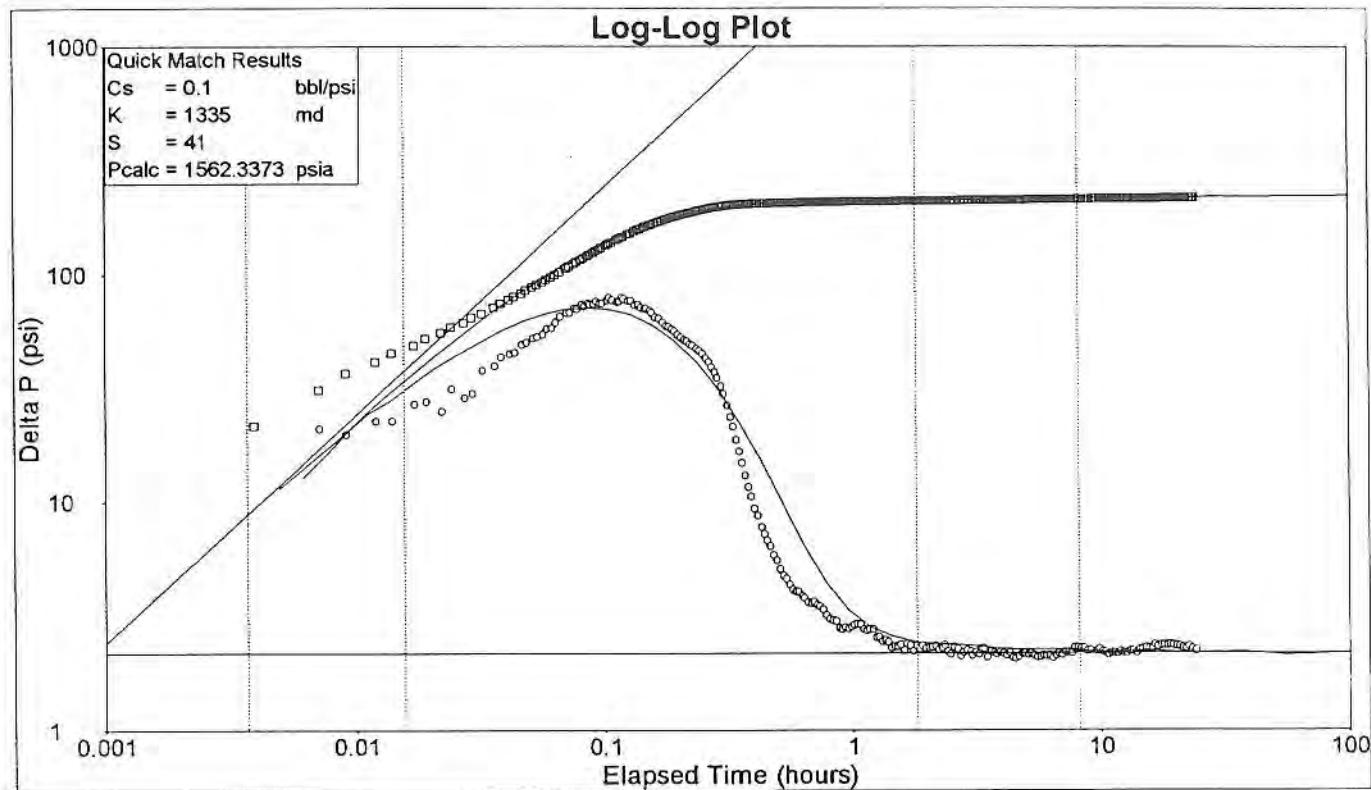
WDW14#2.PAN

MECHANICAL INTEGRITY TEST

Analysis Date:

4/04/94

Fall-Off Test Analysis



HOECHST CELANESE

CHEMICAL GROUP, INC.

WDW-14 Well #2

Bay City Facility, Texas

02/16-19/1994

Log-Log plot used to identify flow regimes.

End of unit slope: Approximately 0.015 hours

Start of infinite acting flow period: Approximately 1.8 hours

Time to exit waste front: Approximately 2.6 hours

FIGURE 4

ECO Solutions, Inc.

Report File:

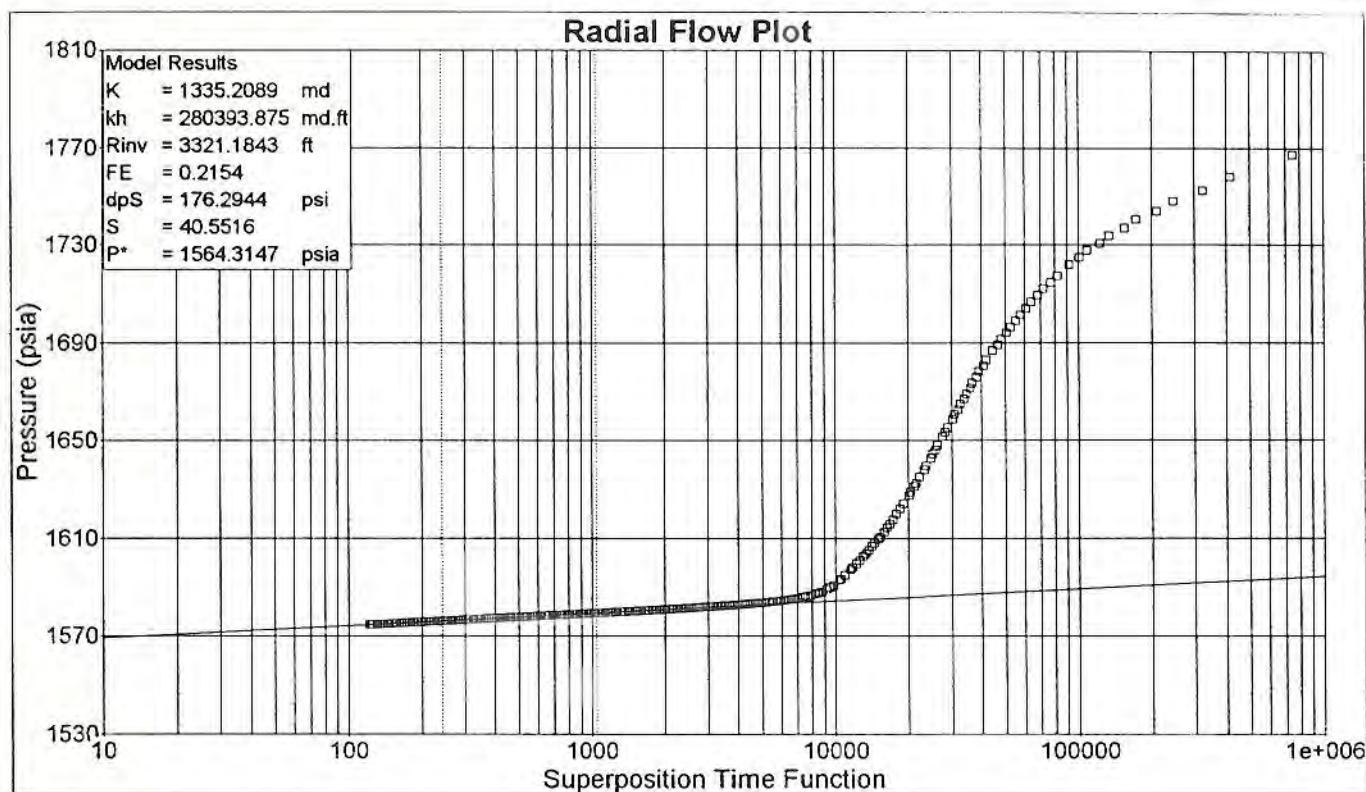
WDW14#2.PAN

MECHANICAL INTEGRITY TEST

Analysis Date:

4/04/94

Fall-Off Test Analysis



HOECHST CELANESE
CHEMICAL GROUP, INC.

WDW-14 Well #2

Bay City Facility, Texas

02/16 - 19/1994

Semi-Log analysis utilizing Superposition Time Function.

FIGURE 5

ECO Solutions, Inc.

Report File:

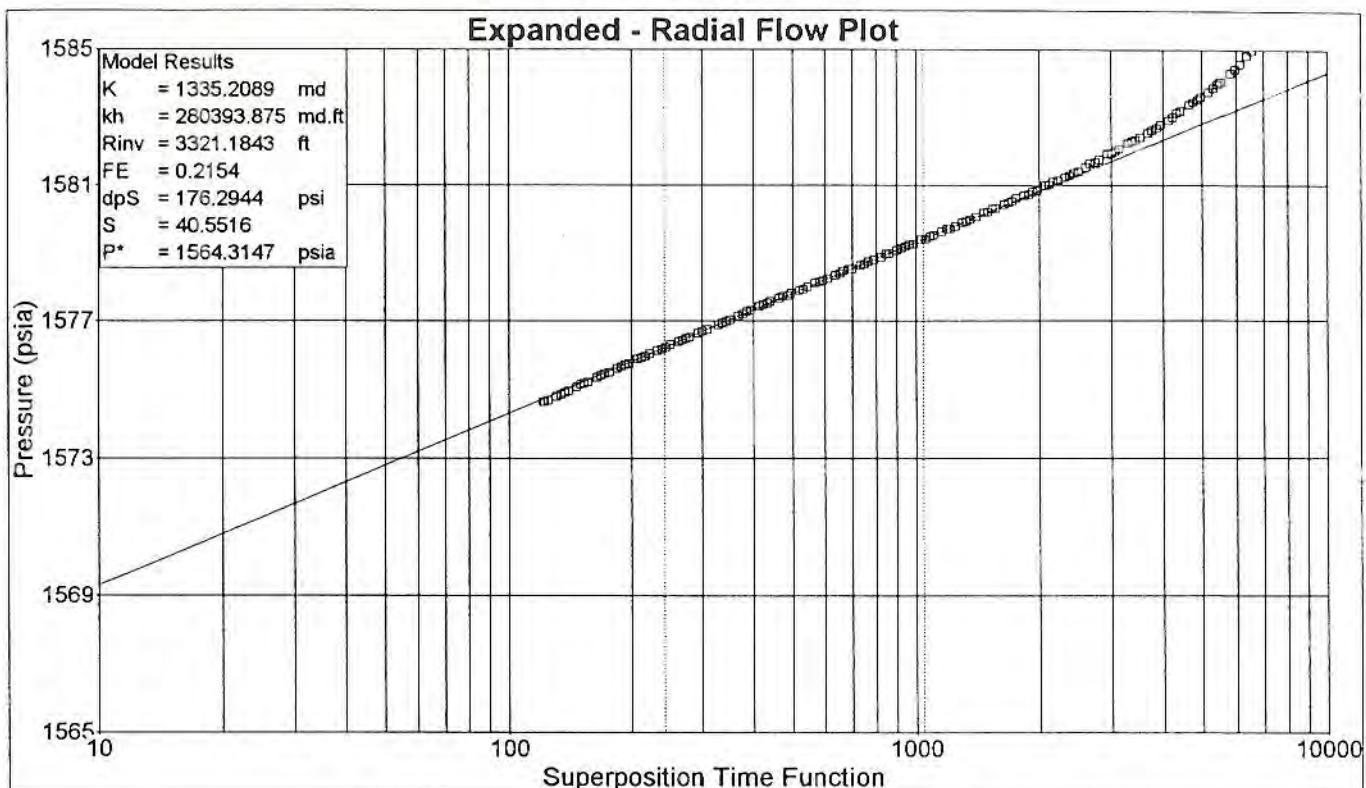
WDW14#2.PAN

MECHANICAL INTEGRITY TEST

Analysis Date:

4/04/94

Fall-Off Test Analysis



HOECHST CELANESE
CHEMICAL GROUP, INC.
WDW-14 Well #2
Bay City Facility, Texas

02/16 - 19/1994

Semi-Log analysis utilizing Superposition Time Function.

FIGURE 6

ECO Solutions, Inc.

Report File:

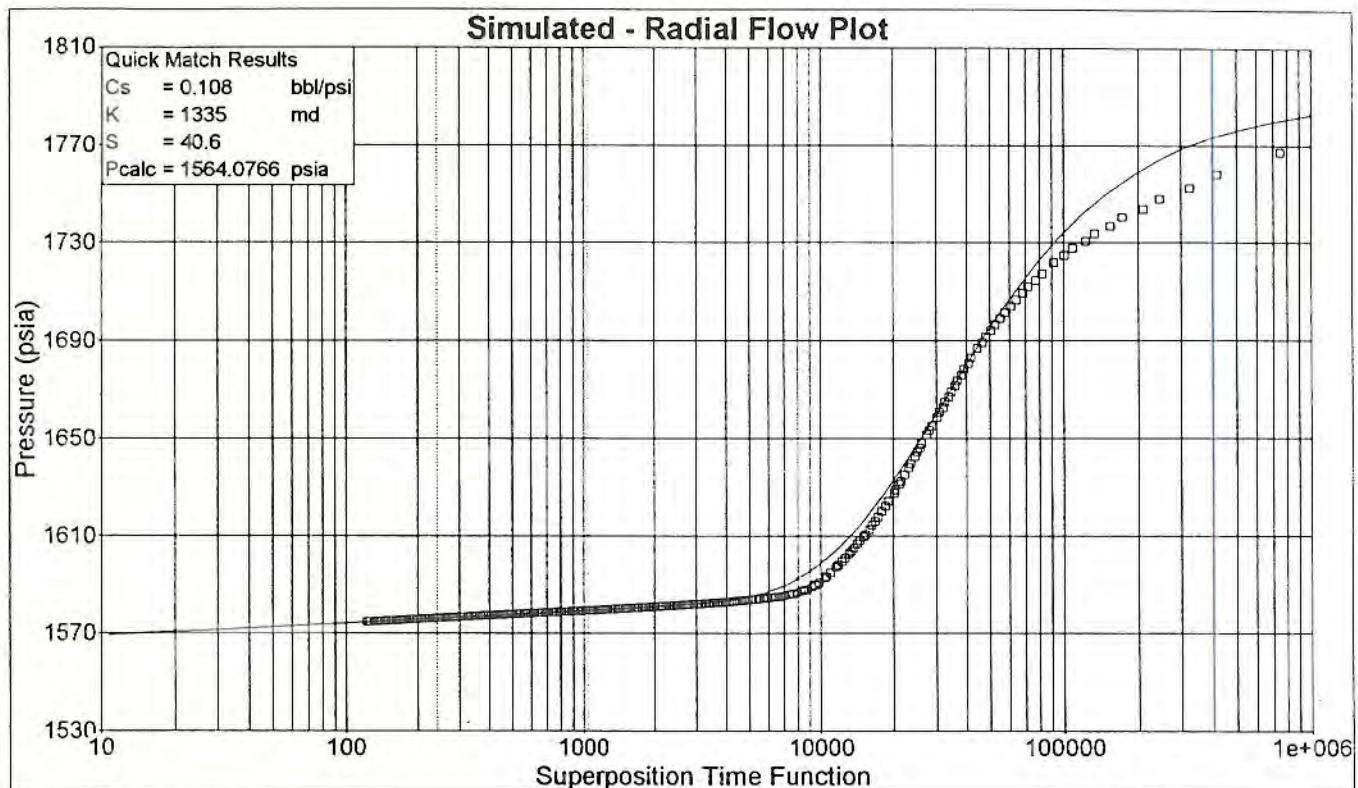
WDW14#2.PAN

MECHANICAL INTEGRITY TEST

Analysis Date:

4/04/94

Fall-Off Test Analysis



HOECHST CELANESE
CHEMICAL GROUP, INC.
WDW-14 Well #2
Bay City Facility, Texas

02/16 - 19/1994

Semi-Log analysis utilizing Superposition Time Function.

FIGURE 7

ECO Solutions, Inc.

Report File:

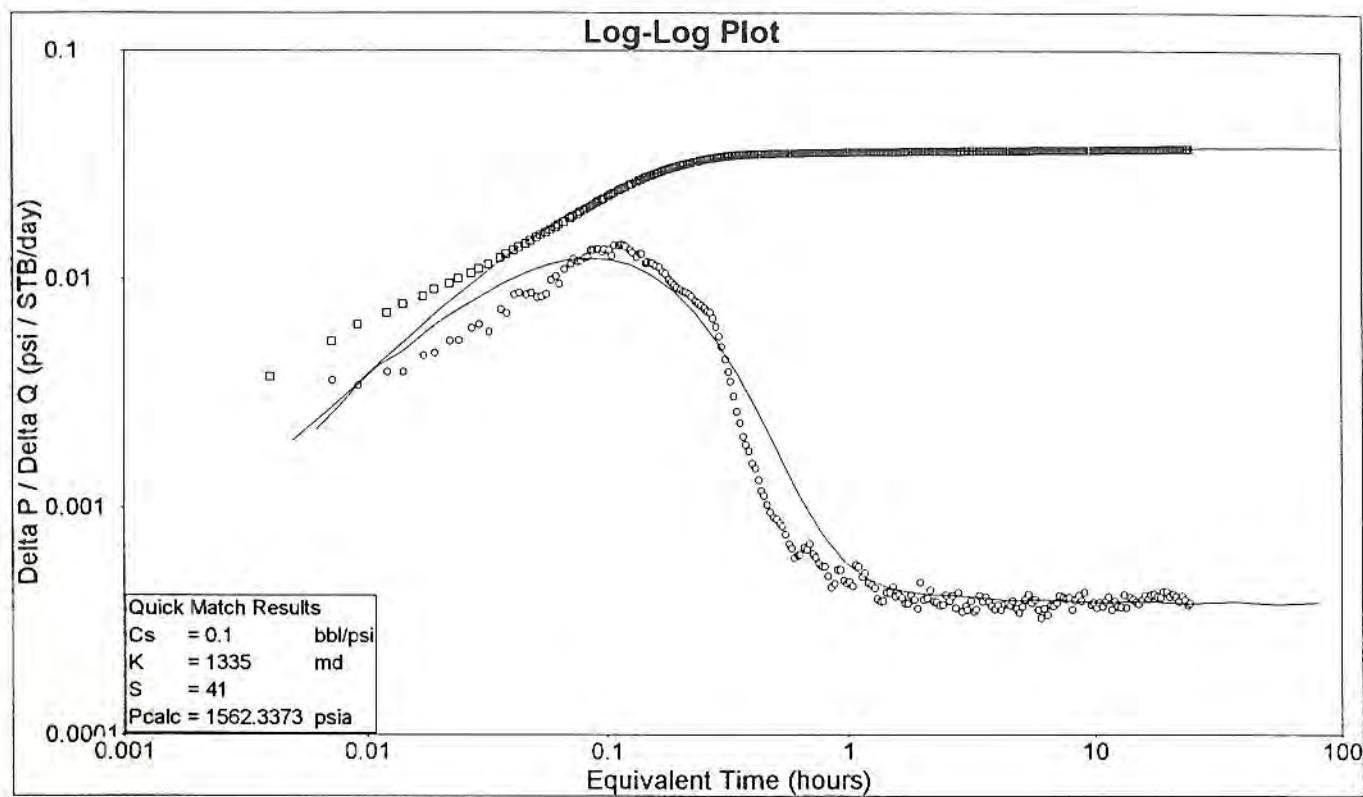
WDW14#2.PAN

MECHANICAL INTEGRITY TEST

Analysis Date:

4/04/94

Fall-Off Test Analysis



HOECHST CELANESE
CHEMICAL GROUP, INC.

WDW-14 Well #2

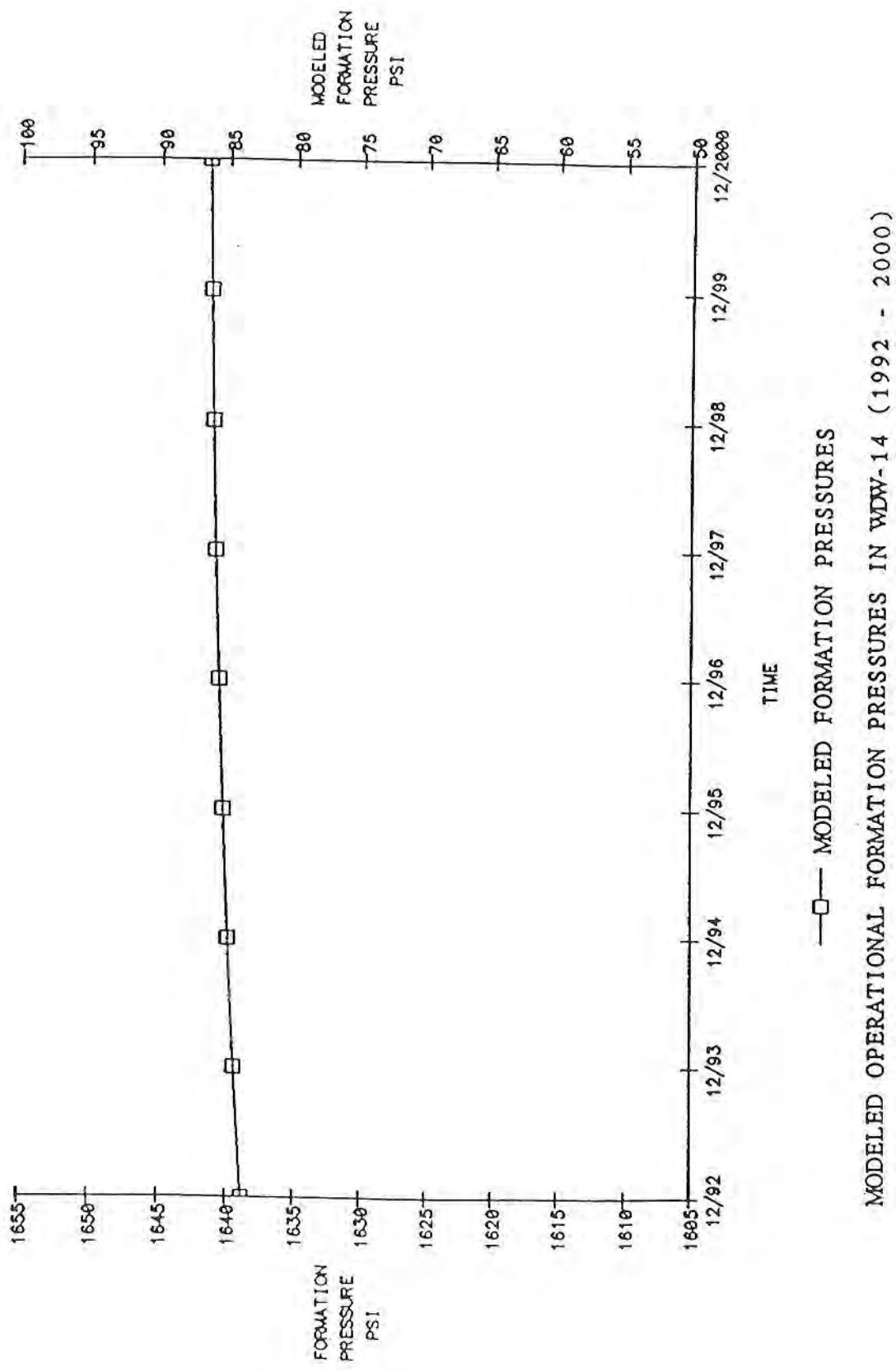
Bay City Facility, Texas

02/16-19/1994

Log-Log analysis utilizing Equivalent time function.

FIGURE 8

FIGURE 9
UPPER MIocene INJECTION SAND - WDW-14



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4.0 EVALUATION OF RADIOACTIVE TRACER SURVEY

INJECTION WELL NO. 2

WDW-14

LOG DATA

Date Run:	February 22, 1994
Logging Service Company	Western Atlas International
Tubing Size and Depth Set	5 1/2" @ 3162'
Casing Size and Depth:	9 5/8" set @ 3650

BASELINE GAMMA-RAY LOG

This baseline gamma-ray log was run from 3348' to 2800'. The purpose of the initial baseline G/R log is to demonstrate repeatability of the logging tools. A comparison of both baseline G/R runs shows good repeatability between the two runs. A gamma ray spike is clearly seen at 3170' which is immediately below the packer. The tracer material was previously ejected from a malfunctioning tool which was subsequently replaced. As is discussed later, the hot spot is determined from additional logging runs to be a casing leak.

BEFORE SURVEY BASELINE GAMMA-RAY LOG 2

A baseline gamma-ray (G/R) was run from 3348' to 2776' to provide a repeat section used in a calibration check. The log is also useful for the following comparisons against additional RAT logging runs.

1. The G/R curves are used as depth control points against other runs during the RAT.
2. The baseline G/R is compared against the final G/R log to check for anomaly areas that could indicate upward migration along a cement channel.

The hot spot beneath the packer at 3170' is again clearly evident.

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CHASE SURVEY 1

The multiple passes or chase survey portion of the RAT provides a check for fluid movement. In this instance, one slug was ejected at a depth of 2900' and it was tracked as it was pumped down the tubing. The pumping rate for this test was 20 gpm and eleven (11) individual passes (files 17 through 24) were made with two detectors as the slug moved from 2900' to 3046'. Both curves are illustrated on the multiple passes portion of the log. The relatively low flow rate of 20 gpm was necessary to allow sufficient time for the logging tools to be lowered to *make multiple passes and record the progress of the radioactive slug. A flow rate higher than 20 gpm would have caused the slug to move so fast that only a few passes could be made resulting in incomplete coverage of the movement. A summary of the individual passes is given below:*

- a. Pass 1 (file 17) - The slug sufficient was at 2900' the logging tool lowered below the tracer material and logged upward. The slug was recorded inside the tubing with its primary peak at 2962'. The logging pass is from 2998' up to 2888'.
- b. Pass 2 (file 18) - The slug was recorded inside the tubing with its peak at 3080'. The slug has moved downward 118' since pass 1. The radioactive slug has spread out slightly by the passes of the logging tool. This is seen by the shape of the G/R response. The peak intensity is lower than pass 1 and the base of the curve is wider.
- c. Pass 3 (file 19) - The slug was recorded in the 9 5/8" protection casing immediately below the packer which is seen on the casing collar log at 3160'. Twin peaks are observed. The main peak is at 3182' and a smaller one is at 3158'. The main slug has moved downward 102' since pass 2 and 220' since pass 1. The smaller peak observed in the baseline runs appears to have increased in intensity but remained at the same depth. The preliminary indication is a hole in the 9 5/8" casing with no apparent movement. The radioactive slug has spread out slightly by the passes of the logging tool.

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- d. Pass 4 (file 20) - The main slug continues to move downward with its peak at 3214'. The slug has moved downward 32' since pass 3 and 252' since pass 1. In the larger casing diameter, the fluid movement is slower. The secondary peak is unchanged and recorded at 3168'.
- e. Pass 5 (file 21) - The slug was recorded in the 9 5/8" long string casing (below the packer) with its peak at 3248'. The slug has moved downward 34' since pass 4 and 286' since pass 1. The slug shape appears more compacted due to the lower velocity in the larger diameter. No upward migration is indicated on the secondary peak or hot spot at 3168'.
- f. Pass 6 (file 22) - The main body of the radioactive slug is in the 9 5/8" casing. The slug was recorded with its peak at 3281'. The slug has moved downward 33' since pass 5 and 319' since pass 1. The secondary peak is not observed on this pass since the run was completed at a deeper depth.
- g. Pass 7 (file 23) - The main body of the radioactive slug is in the 9 5/8" casing. The slug was recorded with its peak at 3314'. The slug has moved downward 33' since pass 6 and 352' since pass 1. The radioactive slug has spread slightly and its intensity diminished since it is being injected. The secondary peak is not observed on this pass since the run was completed at a deeper depth.
- h. Pass 8 (file 24) - The main body of the radioactive slug is in the 9 5/8" casing. The slug was recorded with its peak at 3344'. The slug has moved downward 30' since pass 7 and 382' since pass 1. No upward migration is noted. The slug is passing downward past the tool as it is injected. The peak is much smaller in amplitude.
- i. Pass 9 (file 25) - No distinctive peak is observed although the residual of the tracer slug is still observable. A majority of the tracer material has been injected and no upward fluid movement from the injection interval is indicated. The secondary peak is not observed on this pass since the run was completed at a deeper depth.

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- j. Pass 10 (file 26) - No distinctive peak is observed although a small residual of the tracer slug is still observable. The log reading is near the original baseline. A majority of the tracer material has been injected and no upward fluid movement from the injection interval is indicated. The secondary peak is not observed on this pass since the run was completed at a deeper depth.
- k. Pass 11 (file 27) - This is a final pass from 3048' up past the packer to a depth of 3082'. A baseline reading is recorded with the exception of the hot spot at 3068'. No movement in the anomaly area is indicated.

CHASE SURVEY 2

The second multiple passes or chase survey portion of the RAT provides a redundant check for fluid movement and verifies the findings from the first chase survey. In this instance, one slug was ejected at a depth of 2900' and it was tracked as it was pumped down the tubing. The pumping rate for this test was 20 gpm and nine (9) individual passes (files 28 through 36) were made with two detectors as the slug moved from 2900' to 3046'. Both curves are illustrated on the multiple passes portion of the log. The flow rate of 20 gpm is used which is identical to chase survey no. 1. A summary of the individual passes is given below:

- a. Pass 1A (file 28) - The slug was released at 2900' and the tool lowered below the tracer material and logged upward. The slug was recorded inside the tubing with its primary peak at 2971'. The logging pass is from 3000' up to 2900'.
- b. Pass 2A (file 29) - The slug was recorded inside the tubing above the packer which is at 3160'. The slug peak is at 3120'. The slug has moved downward 149' since pass 1A. The radioactive slug has spread out which created a loss in amplitude. This shape is normal and is seen by the shape of the G/R response. In other words, the peak intensity is lower than pass 1A and the base of the curve is wider.

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- c. Pass 3A (file 30) - The slug was recorded in the 9 5/8" protection casing below the packer which is seen on the casing collar log at 3160'. As in chase survey 1, twin peaks are observed. The slug peak is at 3211'. The main slug has moved downward 91' since pass 2A and 240' since pass 1A. The smaller peak observed above the main slug body appears to have increased in intensity but remained at the same depth of 3167'. The preliminary indication is a hole in the 9 5/8" casing with no apparent fluid movement. The lower radioactive slug has spread out slightly by the passes of the logging tool.
- d. Pass 4A (file 31) - The main body of the radioactive slug is in the 9 5/8" casing. The slug was recorded with its peak at 3261'. The slug has moved downward 104' since pass 3A and 344' since pass 1A. The secondary peak is not observed on this pass since the run was completed at a deeper depth. With the exception of the anomaly at 3167', no additional slug separation is observed.
- e. Pass 5A (file 32) -The main body of the radioactive slug is in the 9 5/8" casing. The slug was recorded with its peak at 3300'. The slug has moved downward 39' since pass 4A and 383' since pass 1A. No upward migration is noted. The slug is passing downward past the tool as it is injected. The peak is much smaller in amplitude.
- f. Pass 6A (file 33) - No sharp peak is observed although the tracer slug is still easily observable. Much of the tracer material has been injected and no upward fluid movement from the injection interval is indicated. The secondary peak is not observed on this pass since the run was completed at a deeper depth
- g. Pass 7A & 8A (files 34 & 35) - No distinctive peak is observed although a small residual of the tracer slug is still observable. The log reading on pass 8A (file 35) is near the original baseline. A majority of the tracer material has been injected and no upward fluid movement from the injection interval is indicated. The secondary peak is not observed on this pass since the run was completed at a deeper depth.

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- j. Pass 9A (file 36) - This is a final pass from 3050' up past the packer to a depth of 3116'. A baseline reading is recorded with the exception of the hot spot at 3068'. No movement in the anomaly area is indicated.

FIRST STATIONARY READING ON TIME DRIVE

The stationary survey checks for upward migration under a high flow rate condition. In this case, a radioactive slug was released above 3342' and the recording done on a time drive basis. Fluid was pumped into the well at 50 gallons per minute (gpm) while recording the background radioactivity at a stationary point (3342') for 30 minutes. Since the slug was released above the detector, its passage is indicated on the log. Pumping is continued for the remainder of the 30 minute period while recording. No second G/R peak was detected and as such no upward migration from the injection interval was detected.

SECOND STATIONARY READING ON TIME DRIVE

This pass is identical to the previous pass but serves as a double check of the equipment and the presence of upward migration. The flow rate and tool position are the same as the previous pass.

A radioactive slug was released at 3342' and the recording done on a time drive basis. Fluid is pumped into the well at 50 gallons per minute (gpm) while recording the background radioactivity at a stationary point (3342') for 30 minutes. Since the slug is released above the detector, its passage is indicated on the log. Pumping is continued for the remainder of the 30 minute period while recording. No second G/R peak was detected and as such no upward migration from the injection interval was detected.

AFTER SURVEY BASELINE GAMMA-RAY LOG

Immediately after the secondary stationary survey, the logging tool was lowered to 3350'. An after survey baseline G/R log was recorded (file 41). The purpose of this log is to compare it with the before survey baseline G/R log to look for anomaly areas. These areas would appear as "hot spots" or areas in which the G/R readings have been elevated above background levels. A comparison between the before and after baseline G/R logs indicates the following:

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1. The spike indicated at 3168' is residual tracer indicating a hole in the casing at that depth.
2. Two additional peaks not previously observed are indicated below the anomaly at 3168'. One is at 3179' and the other is at 3189'. The interpretation is that fluid movement downward occurred from the casing hole at 3168' in response to the increase in flow rate from 20 gpm to 50 gpm for the stationary surveys.

SECOND AFTER SURVEY BASELINE GAMMA-RAY LOG

A second baseline survey (file 42) was run to further record the downward movement observed from the anomaly area at 3168'. A comparison between the first and second after baseline G/R logs indicates the following:

1. The spike indicated at 3168' allowing fluid to exit the casing and move downward.
2. The two additional peaks not previously observed appear to be moving downward although the initial anomaly at 3168' has not moved.

MULTIPLE AFTER SURVEY BASELINE GAMMA-RAY LOG PASSES

Six additional baseline survey (files 43-48) were run to further record the downward movement observed from the anomaly area at 3168'. The overall result was to :

1. They supported the previous logging passes that there is a hole in the 9 5/8" casing at 3168' allowing fluid to exit the casing.
2. Fluid movement downward from 3168' is occurring.

4.1 RADIOACTIVE TRACER SURVEY CONCLUSIONS

1. A hole in the 9 5/8" casing is indicated at 3168' which is located immediately below the packer.

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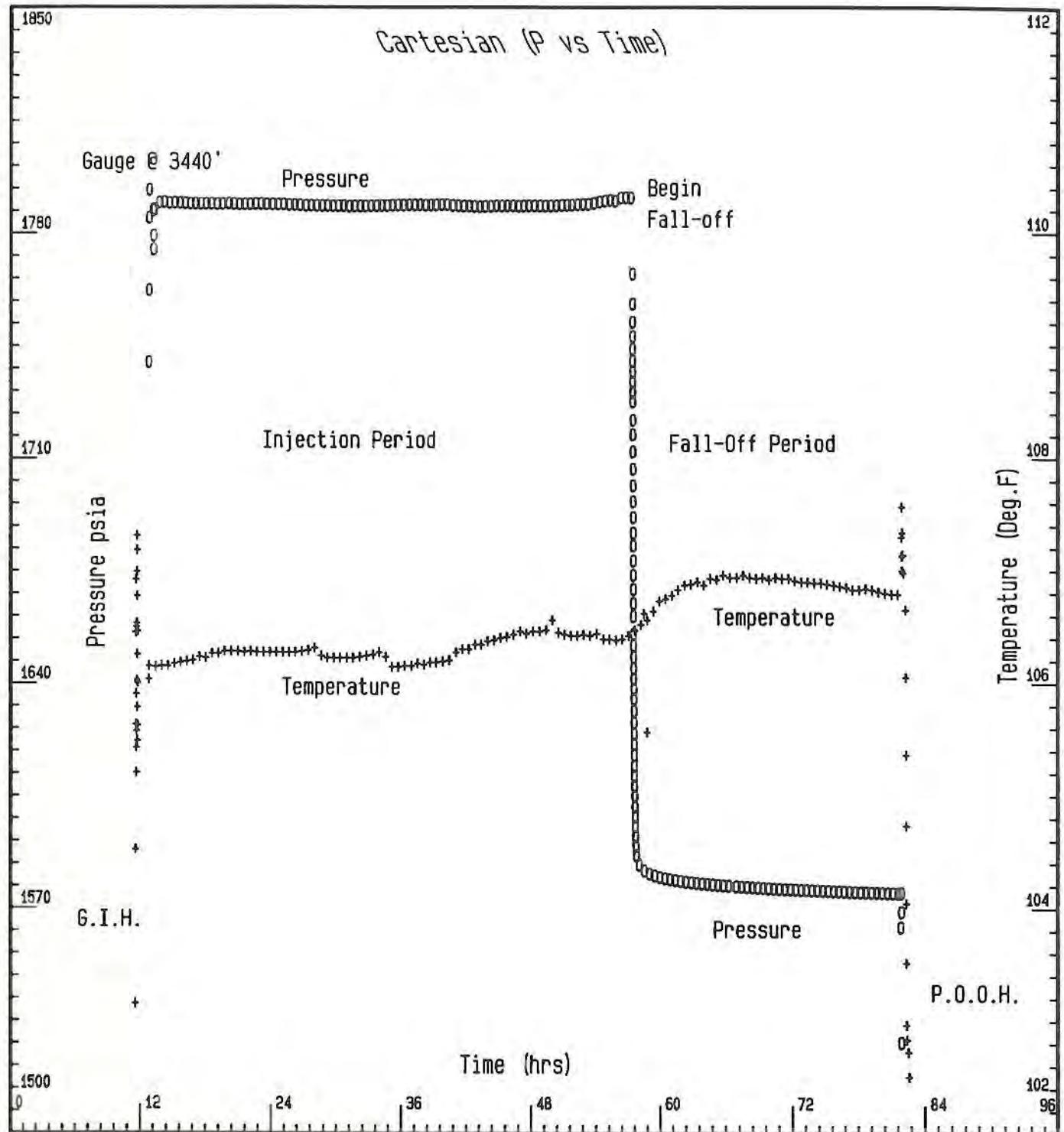
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2. A small volume of fluid is exiting the casing at 3168' with the majority being injected through the perforations.
3. Fluid movement is indicated in a downward direction from 3168', however it does not extend to the top of the injection interval.
4. No upward fluid movement is observed from the casing leak at 3168' nor from the injection interval.
5. Fluid movement into the casing hole at 3168' was not observed at the lower flow rate of 20 gpm. Only when the flow rate was increased to 50 gpm was downward fluid movement initiated.
6. Since no anomaly in the area surrounding 3168' was observed on the temperature log, it is concluded that significant volumes of fluid have not entered the casing hole.

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Hoechst Celanese Chemical Group, Inc.
Pressure Falloff/MIT Testing**

APPENDIX A

GENERAL FALLOFF PLOTS



Company: HOECHST CELANESE CHEMICAL GROUP, INC. Begin Time: 10:50:04 02/16/1994
 Well: WDW-14 WELL #2 End Time: 11:34:12 02/19/1994
 Field: BAY CITY FACILITY, TEXAS

Date: 02/16/1994

Injection Pressure = 1790 psi
 Shut-in Pressure = 1575 psi
 Injection Rate = 169 GPM

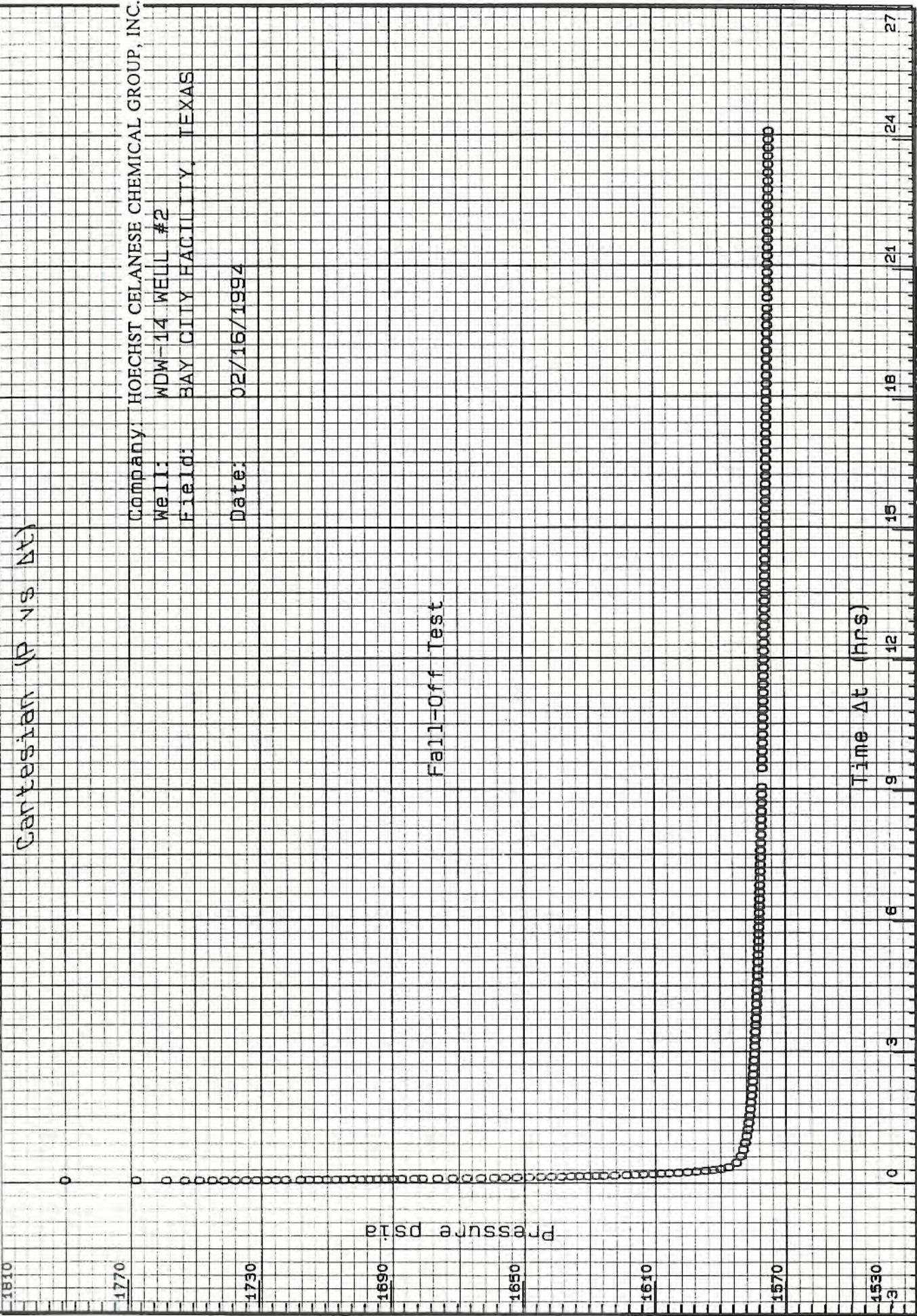
Cartesian (P vs Δt)

Company: HOECHST CELANESE CHEMICAL GROUP, INC.
Well: MDW-14 WELL #2
Field: BAY CITY FACILITY, TEXAS

Date: 02/16/1992

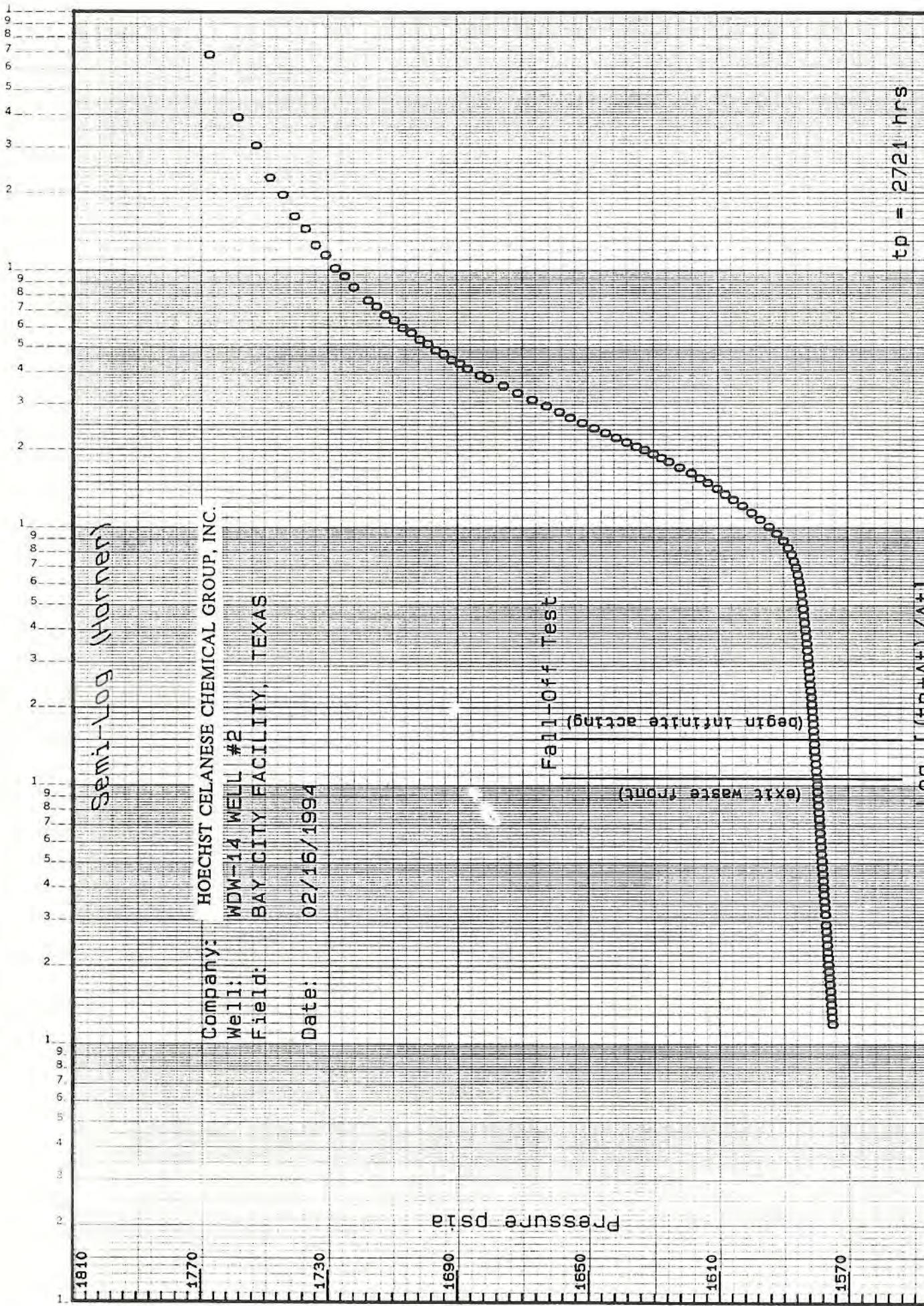
Fall-Off Test

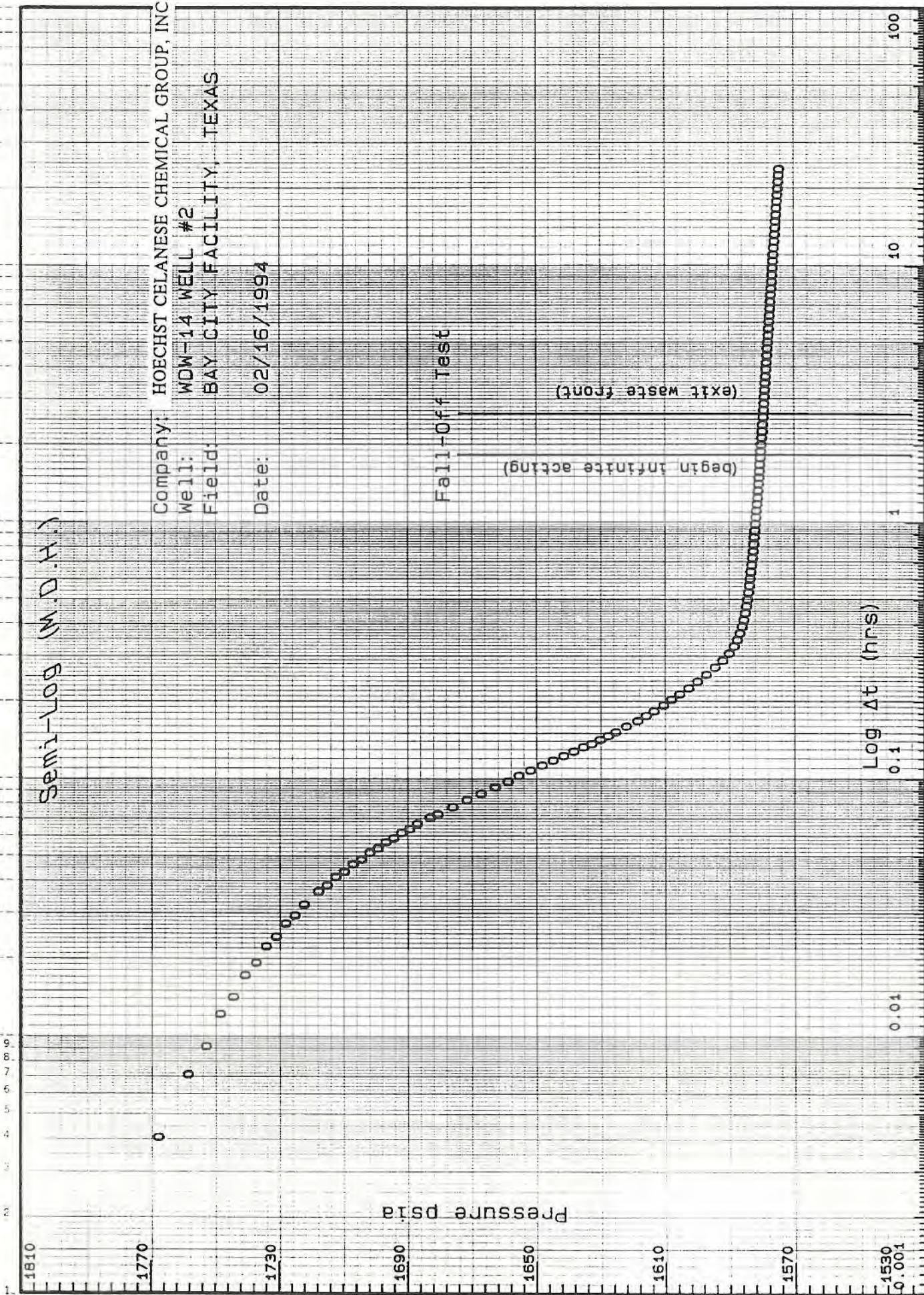
Pressure PSIA



K•Σ SEMI-LOGARITHMIC 5 CYCLES X 10 DIVISIONS
KEUFFEL & FASSEY CO. MADE IN U.S.A.

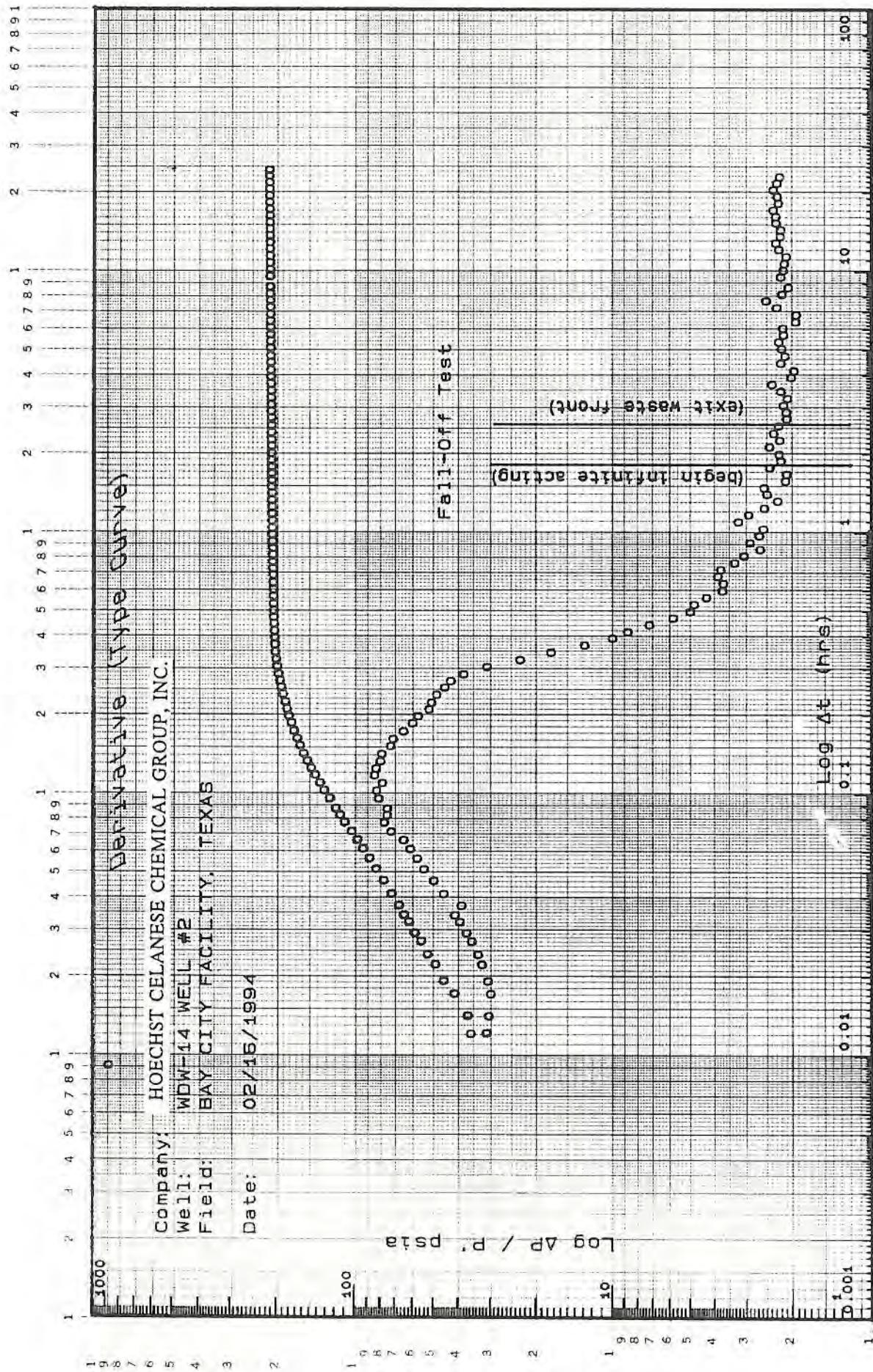
46 6210





KoE LOGARITHMIC 3 x 5 CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 7520



**ECO Solutions, Inc.
Hoechst Celanese Chemical Group, Inc.
Pressure Falloff/MIT Testing**

APPENDIX B

FALLOFF DATA

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

[Wednesday: Feb. 16, 1994]
 Page 1

REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
-------	-----	-----------	----------	------------	-------------

Start GRC Data Acquisition System.
 GRC EPG-520 gauge (S/N 69491).

1	0	10:50: 4	0.0000	13.19	73.12
12	0	10:55:21	0.0880	13.26	73.71
		Pressure up lubricator.			
23	0	11: 0:38	0.1760	490.35	74.31
34	0	11: 5:54	0.2640	492.88	86.43
45	0	11:11:11	0.3520	492.63	86.15
56	0	11:16:28	0.4400	496.83	85.37
67	0	11:21:45	0.5280	493.11	86.01
78	0	11:27: 2	0.6160	492.90	85.10
		Start in hole with gauge.			
80	0	11:27:59	0.6320	496.03	84.88
89	0	11:32:18	0.7040	537.61	106.88
100	0	11:37:35	0.7920	652.41	107.38
		Disconnect gauge to tie into packer w/CCL.			
110	0	12:45: 2	1.9160	1739.90	106.03
		Gauge at Test Depth of 3440 feet.			
		Monitoring Bottom Hole Injection Pressure.			
		Injection Rate is approximately			
114	0	12:46:57	1.9480	1793.39	106.11
121	0	12:50:18	2.0040	1793.23	106.09
132	0	12:55:35	2.0920	1793.13	106.12
143	0	13: 0:52	2.1800	1793.07	106.13
154	0	13: 6: 9	2.2680	1793.11	106.14
		Plant operator blocked valve by mistake, pressure decrease observed.			
159	0	13: 8:33	2.3080	1792.92	106.14
165	0	13:11:26	2.3560	1788.73	106.13
176	0	13:16:42	2.4440	1788.41	106.14
187	0	13:21:59	2.5320	1788.77	106.14
198	0	13:27:16	2.6200	1788.98	106.15
209	0	13:32:33	2.7080	1789.22	106.15
220	0	13:37:50	2.7960	1789.53	106.15
231	0	13:43: 6	2.8840	1789.54	106.15
242	0	13:48:23	2.9720	1789.54	106.16
253	0	13:53:40	3.0600	1789.54	106.15
264	0	13:58:57	3.1480	1789.59	106.15
275	0	14: 4:14	3.2360	1789.65	106.15
286	0	14: 9:30	3.3240	1789.72	106.15
296	0	14:14:47	3.4120	1789.69	106.16
307	0	14:20: 4	3.5000	1789.65	106.16
318	0	14:25:21	3.5880	1789.60	106.16
329	0	14:30:38	3.6760	1789.33	106.15
340	0	14:35:54	3.7640	1789.35	106.16
351	0	14:41:11	3.8520	1789.41	106.15
362	0	14:46:28	3.9400	1789.46	106.16
373	0	14:51:45	4.0280	1789.40	106.16
384	0	14:57: 2	4.1160	1789.40	106.16
395	0	15: 2:18	4.2040	1789.48	106.16
406	0	15: 7:35	4.2920	1789.51	106.17
417	0	15:12:52	4.3800	1789.49	106.17
428	0	15:18: 9	4.4680	1789.51	106.17
439	0	15:23:26	4.5560	1789.49	106.17
450	0	15:28:42	4.6440	1789.47	106.17

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

[Wednesday: Feb. 16, 1994]
 Page 2

REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg. F)
461	0	15:33:59	4.7320	1789.43	106.17
472	0	15:39:16	4.8200	1789.44	106.17
483	0	15:44:33	4.9080	1789.45	106.18
494	0	15:49:50	4.9960	1789.22	106.17
505	0	15:55: 6	5.0840	1789.34	106.18
516	0	16: 0:23	5.1720	1789.30	106.18
527	0	16: 5:40	5.2600	1789.33	106.18
538	0	16:10:57	5.3480	1789.36	106.19
549	0	16:16:14	5.4360	1789.32	106.18
560	0	16:21:30	5.5240	1789.36	106.19
571	0	16:26:47	5.6120	1789.26	106.20
582	0	16:32: 4	5.7000	1789.21	106.19
593	0	16:37:21	5.7880	1789.23	106.20
604	0	16:42:38	5.8760	1789.14	106.21
615	0	16:47:54	5.9640	1789.23	106.20
626	0	16:53:11	6.0520	1789.08	106.20
637	0	16:58:28	6.1400	1789.15	106.21
648	0	17: 3:45	6.2280	1789.19	106.22
659	0	17: 9: 2	6.3160	1789.11	106.22
670	0	17:14:18	6.4040	1789.13	106.22
681	0	17:19:35	6.4920	1789.15	106.22
692	0	17:24:52	6.5800	1789.16	106.23
703	0	17:30: 9	6.6680	1789.15	106.23
714	0	17:35:26	6.7560	1789.11	106.24
725	0	17:40:42	6.8440	1789.12	106.24
736	0	17:45:59	6.9320	1789.11	106.24
747	0	17:51:16	7.0200	1789.14	106.23
758	0	17:56:33	7.1080	1789.12	106.24
769	0	18: 1:50	7.1960	1789.17	106.23
780	0	18: 7: 6	7.2840	1789.00	106.24
791	0	18:12:23	7.3720	1789.27	106.25
802	0	18:17:40	7.4600	1789.23	106.24
813	0	18:22:57	7.5480	1789.26	106.25
820	0	18:28:42	7.6440	1789.20	106.25
823	0	18:34:28	7.7400	1789.16	106.26
826	0	18:40:14	7.8360	1789.19	106.25
829	0	18:45:59	7.9320	1789.20	106.25
832	0	18:51:45	8.0280	1789.18	106.27
835	0	18:57:30	8.1240	1789.08	106.27
838	0	19: 3:16	8.2200	1789.07	106.27
841	0	19: 9: 2	8.3160	1789.02	106.26
844	0	19:14:47	8.4120	1789.12	106.26
847	0	19:20:33	8.5080	1789.00	106.27
850	0	19:26:18	8.6040	1789.08	106.28
853	0	19:32: 4	8.7000	1789.07	106.28
856	0	19:37:50	8.7960	1789.11	106.28
859	0	19:43:35	8.8920	1789.10	106.28
862	0	19:49:21	8.9880	1789.14	106.27
865	0	19:55: 6	9.0840	1788.99	106.28
868	0	20: 4:32	9.2410	1789.26	106.27
873	0	20:10:42	9.3440	1789.12	106.26
876	0	20:16:32	9.4410	1789.06	106.27
879	0	20:22:14	9.5360	1788.98	106.28
882	0	20:28: 3	9.6330	1789.07	106.28
885	0	20:33:45	9.7280	1789.05	106.28

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

[Wednesday: Feb. 16, 1994]
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
888	0	20:39:30	9.8240	1788.97	106.27
891	0	20:45:20	9.9210	1788.79	106.28
894	0	20:51: 2	10.0160	1788.93	106.28
897	0	20:56:51	10.1130	1788.97	106.28
900	0	21: 2:33	10.2080	1788.93	106.29
903	0	21: 8:18	10.3040	1789.00	106.28
906	0	21:14: 8	10.4010	1788.99	106.28
909	0	21:19:50	10.4960	1789.06	106.29
912	0	21:25:39	10.5930	1789.01	106.28
915	0	21:31:21	10.6880	1788.97	106.27
918	0	21:37: 6	10.7840	1788.98	106.28
921	0	21:42:56	10.8810	1788.99	106.28
924	0	21:48:38	10.9760	1789.03	106.28
927	0	21:54:27	11.0730	1788.93	106.29
930	0	22: 0: 9	11.1680	1788.97	106.28
933	0	22: 5:54	11.2640	1789.01	106.28
936	0	22:11:44	11.3610	1789.00	106.28
939	0	22:17:26	11.4560	1789.02	106.27
942	0	22:23:15	11.5530	1789.11	106.28
945	0	22:28:57	11.6480	1789.05	106.28
948	0	22:34:42	11.7440	1789.06	106.27
951	0	22:40:32	11.8410	1788.91	106.27
954	0	22:46:14	11.9360	1789.04	106.27
957	0	22:52: 3	12.0330	1789.08	106.27
960	0	22:57:45	12.1280	1789.08	106.27
963	0	23: 3:30	12.2240	1789.10	106.27
966	0	23: 9:20	12.3210	1789.08	106.27
969	0	23:15: 2	12.4160	1789.06	106.27
972	0	23:20:51	12.5130	1789.05	106.27
975	0	23:26:33	12.6080	1788.94	106.27
978	0	23:32:18	12.7040	1789.04	106.27
981	0	23:38: 8	12.8010	1788.96	106.27
984	0	23:43:50	12.8960	1788.97	106.27
987	0	23:49:39	12.9930	1789.00	106.26
990	0	23:55:21	13.0880	1789.01	106.27

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993	1	0: 1: 6	13.1840	1789.01	106.26
996	1	0: 6:56	13.2810	1788.96	106.26
999	1	0:12:38	13.3760	1788.99	106.27
1002	1	0:18:27	13.4730	1788.99	106.27
1005	1	0:24: 9	13.5680	1788.98	106.27
1008	1	0:29:54	13.6640	1788.95	106.27
1011	1	0:35:44	13.7610	1788.91	106.26
1014	1	0:41:26	13.8560	1788.92	106.26
1017	1	0:47:15	13.9530	1788.94	106.26
1020	1	0:52:57	14.0480	1788.97	106.27
1023	1	0:58:42	14.1440	1788.78	106.27
1026	1	1: 4:32	14.2410	1788.90	106.26
1029	1	1:10:14	14.3360	1788.91	106.26
1032	1	1:16: 3	14.4330	1788.83	106.26
1035	1	1:21:45	14.5280	1788.69	106.26
1038	1	1:27:30	14.6240	1788.74	106.26
1041	1	1:33:20	14.7210	1788.76	106.27
1044	1	1:39: 2	14.8160	1788.77	106.27
1047	1	1:44:51	14.9130	1788.73	106.27

[ECO SOLUTIONS, INC.]

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

[Thursday: Feb. 17, 1994]
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
1050	1	1:50:33	15.0080	1788.78	106.27
1053	1	1:56:18	15.1040	1788.80	106.27
1056	1	2: 2: 8	15.2010	1788.78	106.27
1059	1	2: 7:50	15.2960	1788.78	106.27
1062	1	2:13:39	15.3930	1788.77	106.27
1065	1	2:19:21	15.4880	1788.70	106.27
1068	1	2:25: 6	15.5840	1788.58	106.27
1071	1	2:30:56	15.6810	1788.64	106.27
1074	1	2:36:38	15.7760	1788.68	106.28
1077	1	2:42:27	15.8730	1788.67	106.28
1080	1	2:48: 9	15.9680	1788.72	106.28
1083	1	2:53:54	16.0640	1788.62	106.28
1086	1	2:59:44	16.1610	1788.55	106.29
1089	1	3: 5:26	16.2560	1788.57	106.28
1092	1	3:11:15	16.3530	1788.60	106.29
1095	1	3:16:57	16.4480	1788.60	106.29
1098	1	3:22:42	16.5440	1788.66	106.29
1101	1	3:28:32	16.6410	1788.63	106.29
1104	1	3:34:14	16.7360	1788.63	106.30
1107	1	3:40: 3	16.8330	1788.57	106.29
1110	1	3:45:45	16.9280	1788.64	106.30
1113	1	3:51:30	17.0240	1788.65	106.30
1116	1	3:57:20	17.1210	1788.59	106.31
1119	1	4: 3: 2	17.2160	1788.61	106.31
1122	1	4: 8:51	17.3130	1788.55	106.32
1125	1	4:14:33	17.4080	1788.66	106.35
1128	1	4:20:18	17.5040	1788.60	106.29
1131	1	4:26: 8	17.6010	1788.61	106.25
1134	1	4:31:50	17.6960	1788.45	106.24
1137	1	4:37:39	17.7930	1788.49	106.23
1140	1	4:43:21	17.8880	1788.55	106.22
1143	1	4:49: 6	17.9840	1788.56	106.22
1146	1	4:54:56	18.0810	1788.59	106.22
1149	1	5: 0:38	18.1760	1788.60	106.22
1152	1	5: 6:27	18.2730	1788.60	106.22
1155	1	5:12: 9	18.3680	1788.49	106.21
1158	1	5:17:54	18.4640	1788.54	106.22
1161	1	5:23:44	18.5610	1788.56	106.22
1164	1	5:29:26	18.6560	1788.53	106.22
1167	1	5:35:15	18.7530	1788.42	106.22
1170	1	5:40:57	18.8480	1788.50	106.21
1173	1	5:46:42	18.9440	1788.50	106.22
1176	1	5:52:32	19.0410	1788.52	106.22
1179	1	5:58:14	19.1360	1788.53	106.22
1182	1	6: 4: 3	19.2330	1788.54	106.22
1185	1	6: 9:45	19.3280	1788.46	106.22
1188	1	6:15:30	19.4240	1788.55	106.22
1191	1	6:21:20	19.5210	1788.40	106.22
1194	1	6:27: 2	19.6160	1788.49	106.22
1197	1	6:32:51	19.7130	1788.48	106.22
1200	1	6:38:33	19.8080	1788.52	106.22
1203	1	6:44:18	19.9040	1788.50	106.22
1206	1	6:50: 8	20.0010	1788.55	106.22
1209	1	6:55:50	20.0960	1788.49	106.22
1212	1	7: 1:39	20.1930	1788.48	106.22

Company: HOECHST CELANESE CORPORATION
Well: WDW-14 WELL #2
Field: BAY CITY FACILITY, TEXAS

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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
1215	1	7: 7:21	20.2880	1788.47	106.22
1218	1	7:13: 6	20.3840	1788.46	106.22
1221	1	7:18:56	20.4810	1788.44	106.22
1224	1	7:24:38	20.5760	1788.46	106.22
1227	1	7:30:27	20.6730	1788.46	106.22
1230	1	7:36: 9	20.7680	1788.42	106.22
1233	1	7:41:54	20.8640	1788.44	106.22
1236	1	7:47:44	20.9610	1788.47	106.22
1239	1	7:53:26	21.0560	1788.46	106.22
1242	1	7:59:15	21.1530	1788.37	106.23
1245	1	8: 4:57	21.2480	1788.44	106.23
1248	1	8:10:42	21.3440	1788.46	106.23
1251	1	8:16:32	21.4410	1788.43	106.23
1254	1	8:22:14	21.5350	1788.47	106.23
1257	1	8:28: 3	21.6330	1788.47	106.23
1260	1	8:33:45	21.7280	1788.43	106.24
1263	1	8:39:30	21.8240	1788.48	106.24
1266	1	8:45:20	21.9210	1788.30	106.24
1269	1	8:51: 2	22.0160	1788.41	106.24
1272	1	8:56:51	22.1130	1788.48	106.25
1275	1	9: 2:33	22.2080	1788.45	106.25
1278	1	9: 8:18	22.3040	1788.47	106.25
1281	1	9:14: 8	22.4010	1788.45	106.25
1284	1	9:19:50	22.4960	1788.37	106.25
1287	1	9:25:39	22.5930	1788.45	106.25
1290	1	9:31:21	22.6880	1788.54	106.26
1293	1	9:37: 6	22.7840	1788.55	106.26
1296	1	9:42:56	22.8810	1788.54	106.26
1299	1	9:48:38	22.9760	1788.55	106.27
1302	1	9:54:27	23.0730	1788.47	106.27
1305	1	10: 0: 9	23.1680	1788.51	106.28
1308	1	10: 5:54	23.2640	1788.53	106.28
1311	1	10:11:44	23.3610	1788.57	106.29
1314	1	10:17:26	23.4560	1788.55	106.30
1317	1	10:23:15	23.5530	1788.58	106.31
1320	1	10:28:57	23.6480	1788.48	106.28
1323	1	10:34:42	23.7440	1788.55	106.19
1326	1	10:40:32	23.8410	1788.57	106.17
1329	1	10:46:14	23.9360	1788.60	106.15
1332	1	10:52: 3	24.0330	1788.71	106.16
1335	1	10:57:45	24.1280	1788.64	106.15
1338	1	11: 3:30	24.2240	1788.66	106.14
1341	1	11: 9:20	24.3210	1788.70	106.14
1344	1	11:15: 2	24.4160	1788.76	106.16
1347	1	11:20:51	24.5130	1788.77	106.15
1350	1	11:26:33	24.6080	1788.81	106.15
1353	1	11:32:18	24.7040	1788.80	106.15
1356	1	11:38: 8	24.8010	1788.80	106.15
1359	1	11:43:50	24.8960	1788.80	106.15
1362	1	11:49:39	24.9930	1788.75	106.14
1365	1	11:55:21	25.0630	1788.74	106.15
1368	1	12: 1: 6	25.1840	1788.70	106.15
1371	1	12: 6:56	25.2810	1788.70	106.15
1374	1	12:12:38	25.3760	1788.74	106.15
1377	1	12:18:27	25.4730	1788.77	106.15

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
1380	1	12:24: 9	25.5680	1788.70	106.14
1383	1	12:29:54	25.6640	1788.76	106.14
1386	1	12:35:44	25.7610	1788.77	106.15
1389	1	12:41:26	25.8560	1788.78	106.16
1392	1	12:47:15	25.9530	1788.71	106.16
1395	1	12:52:57	26.0480	1788.73	106.15
1398	1	12:58:42	26.1440	1788.81	106.15
1401	1	13: 4:32	26.2410	1788.77	106.16
1404	1	13:10:14	26.3360	1788.78	106.16
1407	1	13:16: 3	26.4330	1788.65	106.16
1410	1	13:21:45	26.5280	1788.71	106.16
1413	1	13:27:30	26.6240	1788.76	106.17
1416	1	13:33:20	26.7210	1788.77	106.17
1419	1	13:39: 2	26.8160	1788.76	106.16
1422	1	13:44:51	26.9130	1788.78	106.16
1425	1	13:50:33	27.0080	1788.80	106.16
1428	1	13:56:18	27.1040	1788.74	106.16
1431	1	14: 2: 8	27.2010	1788.74	106.16
1434	1	14: 7:50	27.2960	1788.60	106.17
1437	1	14:13:39	27.3930	1788.75	106.17
1440	1	14:19:21	27.4880	1788.72	106.17
1443	1	14:25: 6	27.5840	1788.74	106.17
1446	1	14:30:56	27.6810	1788.69	106.18
1449	1	14:36:38	27.7760	1788.76	106.18
1452	1	14:42:27	27.8730	1788.75	106.18
1455	1	14:48: 9	27.9680	1788.77	106.18
1458	1	14:53:54	28.0640	1788.79	106.19
1461	1	14:59:44	28.1610	1788.68	106.18
1464	1	15: 5:26	28.2560	1788.75	106.18
1467	1	15:11:15	28.3530	1788.82	106.18
1470	1	15:16:57	28.4480	1788.83	106.18
1473	1	15:22:42	28.5440	1788.82	106.19
1476	1	15:28:32	28.6410	1788.75	106.19
1479	1	15:34:14	28.7360	1788.81	106.19
1482	1	15:40: 3	28.8330	1788.85	106.19
1485	1	15:45:45	28.9280	1788.86	106.19
1488	1	15:51:30	29.0240	1788.88	106.19
1491	1	15:57:20	29.1210	1788.85	106.19
1494	1	16: 3: 2	29.2160	1788.84	106.20
1497	1	16: 8:51	29.3130	1788.86	106.19
1500	1	16:14:33	29.4080	1788.86	106.20
1503	1	16:20:18	29.5040	1788.85	106.20
1506	1	16:26: 8	29.6010	1788.79	106.20
1509	1	16:31:50	29.6960	1788.81	106.21
1512	1	16:37:39	29.7930	1788.80	106.21
1515	1	16:43:21	29.8880	1788.64	106.22
1518	1	16:49: 6	29.9840	1788.56	106.23
1521	1	16:54:56	30.0810	1788.64	106.25
1524	1	17: 0:38	30.1760	1788.64	106.27
1527	1	17: 6:27	30.2730	1788.62	106.29
1530	1	17:12: 9	30.3680	1788.67	106.29
1533	1	17:17:54	30.4640	1788.49	106.29
1536	1	17:23:44	30.5610	1788.57	106.29
1539	1	17:29:26	30.6560	1788.60	106.30
1542	1	17:35:15	30.7530	1788.46	106.30

[ECO SOLUTIONS, INC.]

Company: HOECHST CELANESE CORPORATION
Well: WDW-14 WELL #2
Field: BAY CITY FACILITY, TEXAS

[Thursday: Feb. 17, 1994]
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
1545	1	17:40:57	30.8480	1788.45	106.30
1548	1	17:46:42	30.9440	1788.44	106.30
1551	1	17:52:32	31.0410	1788.47	106.30
1554	1	17:58:14	31.1360	1788.37	106.30
1557	1	18: 4: 3	31.2330	1788.42	106.29
1560	1	18: 9:45	31.3280	1788.46	106.31
1563	1	18:15:30	31.4240	1788.44	106.29
1566	1	18:21:20	31.5210	1788.42	106.31
1569	1	18:27: 2	31.6160	1788.44	106.33
1572	1	18:32:51	31.7130	1788.45	106.32
1575	1	18:38:33	31.8080	1788.43	106.32
1578	1	18:44:18	31.9040	1788.33	106.32
1581	1	18:50: 8	32.0010	1788.37	106.33
1584	1	18:55:50	32.0960	1788.37	106.33
1587	1	19: 1:39	32.1930	1788.36	106.33
1590	1	19: 7:21	32.2880	1788.36	106.33
1593	1	19:13: 6	32.3840	1788.38	106.34
1596	1	19:18:56	32.4810	1788.32	106.35
1599	1	19:24:38	32.5760	1788.31	106.35
1602	1	19:30:27	32.6730	1788.35	106.35
1605	1	19:36: 9	32.7680	1788.31	106.35
1608	1	19:41:54	32.8640	1788.29	106.37
1611	1	19:47:44	32.9610	1788.28	106.37
1614	1	19:53:26	33.0560	1788.41	106.36
1617	1	19:59:15	33.1530	1788.39	106.38
1620	1	20: 4:57	33.2480	1788.32	106.36
1623	1	20:10:42	33.3440	1788.40	106.37
1626	1	20:16:32	33.4410	1788.41	106.38
1629	1	20:22:14	33.5360	1788.45	106.38
1632	1	20:28: 3	33.6330	1788.41	106.39
1635	1	20:33:45	33.7280	1788.50	106.38
1638	1	20:39:30	33.8240	1788.49	106.38
1641	1	20:45:20	33.9210	1788.54	106.39
1644	1	20:51: 2	34.0160	1788.53	106.38
1647	1	20:56:51	34.1130	1788.56	106.40
1650	1	21: 2:33	34.2080	1788.55	106.40
1653	1	21: 8:18	34.3040	1788.37	106.40
1656	1	21:14: 8	34.4010	1788.44	106.39
1659	1	21:19:50	34.4960	1788.45	106.41
1662	1	21:25:39	34.5930	1788.50	106.43
1665	1	21:31:21	34.6880	1788.48	106.42
1668	1	21:37: 6	34.7840	1788.50	106.40
1671	1	21:42:56	34.8810	1788.48	106.41
1674	1	21:48:38	34.9760	1788.47	106.41
1677	1	21:54:27	35.0730	1788.49	106.41
1680	1	22: 0: 9	35.1680	1788.47	106.41
1683	1	22: 5:54	35.2640	1788.57	106.42
1686	1	22:11:44	35.3610	1788.56	106.43
1689	1	22:17:26	35.4560	1788.55	106.43
1692	1	22:23:15	35.5530	1788.33	106.43
1695	1	22:28:57	35.6480	1788.45	106.44
1698	1	22:34:42	35.7440	1788.45	106.46
1701	1	22:40:32	35.8410	1788.52	106.45
1704	1	22:46:14	35.9360	1788.49	106.45
1707	1	22:52: 3	36.0330	1788.51	106.44

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
1710	1	22:57:45	36.1280	1788.56	106.46
1713	1	23: 3:30	36.2240	1788.57	106.46
1716	1	23: 9:20	36.3210	1788.55	106.47
1719	1	23:15: 2	36.4160	1788.40	106.45
1722	1	23:20:51	36.5130	1788.52	106.44
1725	1	23:26:33	36.6080	1788.56	106.44
1728	1	23:32:18	36.7040	1788.54	106.45
1731	1	23:38: 8	36.8010	1788.58	106.45
1734	1	23:43:50	36.8960	1788.58	106.45
1737	1	23:49:39	36.9930	1788.55	106.45
1740	1	23:55:21	37.0880	1788.47	106.44
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1743	2	0: 1: 6	37.1840	1788.55	106.46
1746	2	0: 6:56	37.2810	1788.60	106.46
1749	2	0:12:38	37.3760	1788.58	106.46
1752	2	0:18:27	37.4730	1788.60	106.47
1755	2	0:24: 9	37.5680	1788.56	106.46
1758	2	0:29:54	37.6640	1788.55	106.45
1761	2	0:35:44	37.7610	1788.58	106.45
1764	2	0:41:26	37.8560	1788.65	106.46
1767	2	0:47:15	37.9530	1788.59	106.46
1770	2	0:52:57	38.0480	1788.38	106.46
1773	2	0:58:42	38.1440	1788.49	106.46
1776	2	1: 4:32	38.2410	1788.51	106.46
1779	2	1:10:14	38.3360	1788.53	106.46
1782	2	1:16: 3	38.4330	1788.51	106.46
1785	2	1:21:45	38.5280	1788.50	106.47
1788	2	1:27:30	38.6240	1788.52	106.47
1791	2	1:33:20	38.7210	1788.56	106.48
1794	2	1:39: 2	38.8160	1788.60	106.49
1797	2	1:44:51	38.9130	1788.61	106.51
1800	2	1:50:33	39.0080	1788.60	106.53
1803	2	1:56:18	39.1040	1788.65	106.57
1806	2	2: 2: 8	39.2010	1788.58	106.57
1809	2	2: 7:50	39.2960	1788.63	106.54
1812	2	2:13:39	39.3930	1788.70	106.51
1815	2	2:19:21	39.4880	1788.65	106.48
1818	2	2:25: 6	39.5840	1788.72	106.46
1821	2	2:30:56	39.6810	1788.68	106.45
1824	2	2:36:38	39.7760	1788.69	106.44
1827	2	2:42:27	39.8730	1788.80	106.44
1830	2	2:48: 9	39.9680	1788.73	106.43
1833	2	2:53:54	40.0640	1788.68	106.43
1836	2	2:59:44	40.1610	1788.74	106.43
1839	2	3: 5:26	40.2560	1788.79	106.43
1842	2	3:11:15	40.3530	1788.83	106.43
1845	2	3:16:57	40.4480	1788.81	106.43
1848	2	3:22:42	40.5440	1788.83	106.43
1851	2	3:28:32	40.6410	1788.82	106.42
1854	2	3:34:14	40.7360	1788.85	106.42
1857	2	3:40: 3	40.8330	1788.75	106.42
1860	2	3:45:45	40.9280	1788.86	106.42
1863	2	3:51:30	41.0240	1788.89	106.42
1866	2	3:57:20	41.1210	1788.88	106.42
1869	2	4: 3: 2	41.2160	1788.95	106.42

[ECO SOLUTIONS, INC.]

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
1872	2	4: 8:51	41.3130	1788.96	106.42
1875	2	4:14:33	41.4080	1788.98	106.42
1878	2	4:20:18	41.5040	1788.96	106.43
1881	2	4:26: 8	41.6010	1788.96	106.43
1884	2	4:31:50	41.6960	1788.93	106.43
1887	2	4:37:39	41.7930	1789.00	106.43
1890	2	4:43:21	41.8880	1788.95	106.43
1893	2	4:49: 6	41.9840	1789.11	106.43
1896	2	4:54:56	42.0810	1789.10	106.43
1899	2	5: 0:38	42.1760	1789.08	106.42
1902	2	5: 6:27	42.2730	1789.14	106.43
1905	2	5:12: 9	42.3680	1789.13	106.42
1908	2	5:17:54	42.4640	1789.05	106.42
1911	2	5:23:44	42.5610	1789.17	106.42
1914	2	5:29:26	42.6560	1789.22	106.42
1917	2	5:35:15	42.7530	1789.35	106.43
1920	2	5:40:57	42.8480	1789.41	106.43
1923	2	5:46:42	42.9440	1789.46	106.43
1926	2	5:52:32	43.0410	1789.58	106.43
1929	2	5:58:14	43.1360	1789.57	106.44
1932	2	6: 4: 3	43.2330	1789.68	106.45
1935	2	6: 9:45	43.3280	1789.85	106.41
1938	2	6:15:30	43.4240	1789.80	106.39
1941	2	6:21:20	43.5210	1789.92	106.39
1944	2	6:27: 2	43.6160	1789.88	106.39
1947	2	6:32:51	43.7130	1790.00	106.39
1950	2	6:38:33	43.8080	1790.04	106.39
1953	2	6:44:18	43.9040	1790.12	106.39
1956	2	6:50: 8	44.0010	1790.19	106.39
1959	2	6:55:50	44.0960	1790.19	106.39
1962	2	7: 1:39	44.1930	1790.27	106.39
1965	2	7: 7:21	44.2880	1790.32	106.38
1968	2	7:13: 6	44.3840	1790.38	106.39
1971	2	7:18:56	44.4810	1790.32	106.38
1974	2	7:24:38	44.5760	1790.47	106.39
1977	2	7:30:27	44.6730	1790.49	106.39
1980	2	7:36: 9	44.7680	1790.65	106.39
1983	2	7:41:54	44.8640	1789.73	106.39
1986	2	7:47:44	44.9610	1790.14	106.38
1989	2	7:53:26	45.0560	1790.87	106.39
1992	2	7:59:15	45.1530	1791.02	106.39
1995	2	8: 4:57	45.2480	1790.91	106.39
1998	2	8:10:42	45.3440	1791.11	106.39
2001	2	8:16:32	45.4410	1791.20	106.40
2004	2	8:22:14	45.5360	1791.15	106.39
2007	2	8:28: 3	45.6330	1791.02	106.40
2010	2	8:33:45	45.7280	1790.97	106.40
2013	2	8:38:51	45.8130	1791.17	106.41
2034	2	8:43:57	45.8980	1791.24	106.40
2055	2	8:48:59	45.9820	1791.25	106.41
2076	2	8:54: 9	46.0680	1791.27	106.41
2097	2	8:59:15	46.1530	1791.26	106.42
2118	2	9: 4:21	46.2380	1791.23	106.44
2145	2	9: 9:27	46.3230	1791.27	106.43
2177	2	9:14:29	46.4070	1791.15	106.46

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
2209	2	9:19:39	46.4930	1791.03	106.44
2220	2	9:21:16	46.5200	1790.43	106.46
2221	2	9:21:30	46.5240	1790.34	106.46
2222	2	9:21:41	46.5270	1790.33	106.46
2223	2	9:21:48	46.5290	1790.30	106.46
2224	2	9:21:59	46.5320	1790.27	106.46
2225	2	9:22: 6	46.5340	1790.27	106.47
2226	2	9:22:17	46.5370	1790.27	106.47
2227	2	9:22:24	46.5390	1790.27	106.47
2228	2	9:22:35	46.5420	1790.27	106.47
2229	2	9:22:42	46.5440	1790.25	106.47
2230	2	9:22:53	46.5470	1790.23	106.47
2231	2	9:23: 0	46.5490	1789.61	106.47
2232	2	9:23:11	46.5520	1789.34	106.47
		Shut down Injection.			
		Start Fall-Off test.			
2233	2	9:23:18	0.0000	1789.11	106.47
2234	2	9:23:33	0.0040	1767.43	106.47
2235	2	9:23:44	0.0070	1758.14	106.46
2236	2	9:23:51	0.0090	1752.50	106.46
2237	2	9:24: 2	0.0120	1748.02	106.46
2238	2	9:24: 9	0.0140	1744.03	106.46
2239	2	9:24:20	0.0170	1740.40	106.46
2240	2	9:24:27	0.0190	1736.98	106.46
2241	2	9:24:38	0.0220	1733.78	106.46
2242	2	9:24:45	0.0240	1730.69	106.46
2243	2	9:24:56	0.0270	1727.70	106.46
2244	2	9:25: 3	0.0290	1724.80	106.47
2245	2	9:25:14	0.0320	1721.93	106.47
2246	2	9:25:28	0.0360	1717.43	106.47
2247	2	9:25:35	0.0380	1714.79	106.47
2248	2	9:25:46	0.0410	1712.07	106.47
2249	2	9:25:53	0.0430	1709.40	106.47
2250	2	9:26: 4	0.0460	1706.72	106.47
2251	2	9:26:11	0.0480	1704.12	106.47
2252	2	9:26:22	0.0510	1701.53	106.47
2253	2	9:26:29	0.0530	1699.00	106.46
2254	2	9:26:40	0.0560	1696.52	106.46
2255	2	9:26:47	0.0580	1694.07	106.46
2256	2	9:26:58	0.0610	1691.61	106.46
2257	2	9:27: 5	0.0630	1689.17	106.46
2258	2	9:27:16	0.0660	1686.79	106.46
2259	2	9:27:30	0.0700	1682.80	106.46
2260	2	9:27:38	0.0720	1680.45	106.46
2261	2	9:27:48	0.0750	1678.12	106.47
2262	2	9:27:56	0.0770	1675.81	106.47
2263	2	9:28: 6	0.0800	1673.59	106.47
2264	2	9:28:14	0.0820	1671.37	106.47
2265	2	9:28:24	0.0850	1669.16	106.47
2266	2	9:28:32	0.0870	1666.98	106.47
2267	2	9:28:42	0.0900	1664.81	106.47
2268	2	9:28:50	0.0920	1662.67	106.47
2269	2	9:29: 0	0.0950	1660.78	106.47
2270	2	9:29: 8	0.0970	1658.71	106.47
2271	2	9:29:26	0.1020	1655.36	106.47

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
2272	2	9:29:33	0.1040	1653.56	106.48
2273	2	9:29:44	0.1070	1651.68	106.48
2274	2	9:29:51	0.1090	1649.84	106.48
2275	2	9:30: 2	0.1120	1648.04	106.49
2276	2	9:30: 9	0.1140	1646.25	106.49
2277	2	9:30:20	0.1170	1644.56	106.49
2278	2	9:30:27	0.1190	1642.88	106.49
2279	2	9:30:38	0.1220	1641.30	106.49
2280	2	9:30:45	0.1240	1639.70	106.49
2281	2	9:30:56	0.1270	1638.15	106.49
2282	2	9:31: 3	0.1290	1636.65	106.49
2283	2	9:31:14	0.1320	1635.18	106.49
2284	2	9:31:28	0.1360	1632.68	106.48
2285	2	9:31:39	0.1390	1631.35	106.49
2286	2	9:31:46	0.1410	1630.14	106.49
2287	2	9:31:57	0.1440	1628.89	106.48
2288	2	9:32: 4	0.1460	1627.66	106.48
2289	2	9:32:15	0.1490	1626.49	106.48
2290	2	9:32:22	0.1510	1625.32	106.48
2291	2	9:32:33	0.1540	1624.20	106.48
2292	2	9:32:40	0.1560	1623.12	106.48
2293	2	9:32:51	0.1590	1622.05	106.48
2294	2	9:32:58	0.1610	1621.02	106.48
2295	2	9:33: 9	0.1640	1620.03	106.48
2296	2	9:33:20	0.1670	1618.48	106.47
2297	2	9:33:30	0.1700	1617.61	106.47
2298	2	9:33:38	0.1720	1616.71	106.47
2299	2	9:33:48	0.1750	1615.86	106.47
2300	2	9:33:56	0.1770	1615.04	106.47
2301	2	9:34: 6	0.1800	1614.23	106.47
2302	2	9:34:14	0.1820	1613.43	106.46
2303	2	9:34:24	0.1850	1612.64	106.46
2304	2	9:34:32	0.1870	1611.89	106.46
2305	2	9:34:42	0.1900	1611.15	106.46
2306	2	9:34:50	0.1920	1610.43	106.46
2307	2	9:35: 0	0.1950	1609.73	106.46
2308	2	9:35: 8	0.1970	1609.07	106.46
2309	2	9:35:26	0.2020	1607.97	106.46
2310	2	9:35:33	0.2040	1607.32	106.46
2311	2	9:35:44	0.2070	1606.69	106.46
2312	2	9:35:51	0.2090	1606.06	106.46
2313	2	9:36: 2	0.2120	1605.46	106.46
2314	2	9:36: 9	0.2140	1604.87	106.46
2315	2	9:36:20	0.2170	1604.29	106.46
2316	2	9:36:27	0.2190	1603.72	106.46
2317	2	9:36:38	0.2220	1603.17	106.46
2318	2	9:36:45	0.2240	1602.63	106.45
2319	2	9:36:56	0.2270	1602.11	106.45
2320	2	9:37: 3	0.2290	1601.59	106.45
2321	2	9:37:17	0.2330	1600.77	106.45
2322	2	9:37:24	0.2350	1600.31	106.45
2323	2	9:37:35	0.2380	1599.84	106.44
2324	2	9:37:42	0.2400	1599.37	106.45
2325	2	9:37:53	0.2430	1598.91	106.45
2326	2	9:38: 0	0.2450	1598.45	106.45

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

[Friday: Feb. 18, 1994]
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
2327	2	9:38:11	0.2480	1598.01	106.45
2328	2	9:38:18	0.2500	1597.59	106.45
2329	2	9:38:29	0.2530	1597.13	106.45
2330	2	9:38:36	0.2550	1596.71	106.46
2331	2	9:38:47	0.2580	1596.30	106.45
2332	2	9:38:54	0.2600	1595.89	106.45
2333	2	9:39: 5	0.2630	1595.46	106.45
2334	2	9:39:20	0.2670	1594.80	106.45
2335	2	9:39:30	0.2700	1594.41	106.46
2336	2	9:39:38	0.2720	1594.04	106.46
2337	2	9:39:48	0.2750	1593.67	106.46
2338	2	9:39:56	0.2770	1593.32	106.46
2339	2	9:40: 6	0.2800	1592.97	106.46
2340	2	9:40:14	0.2820	1592.64	106.46
2341	2	9:40:24	0.2850	1592.33	106.46
2342	2	9:40:32	0.2870	1592.03	106.46
2343	2	9:40:42	0.2900	1591.73	106.46
2344	2	9:40:50	0.2920	1591.43	106.46
2345	2	9:41: 0	0.2950	1591.16	106.47
2346	2	9:41:15	0.2990	1590.70	106.47
2347	2	9:41:22	0.3010	1590.47	106.47
2348	2	9:41:33	0.3040	1590.23	106.47
2349	2	9:41:40	0.3060	1590.03	106.47
2350	2	9:41:51	0.3090	1589.81	106.47
2351	2	9:41:58	0.3110	1589.59	106.47
2352	2	9:42: 9	0.3140	1589.40	106.47
2353	2	9:42:16	0.3160	1589.21	106.47
2354	2	9:42:27	0.3190	1589.04	106.47
2355	2	9:42:34	0.3210	1588.85	106.47
2356	2	9:42:45	0.3240	1588.69	106.47
2357	2	9:42:52	0.3260	1588.53	106.47
2358	2	9:43: 3	0.3290	1588.38	106.47
2359	2	9:43:17	0.3330	1588.11	106.47
2360	2	9:43:28	0.3360	1587.98	106.47
2361	2	9:43:35	0.3380	1587.86	106.47
2362	2	9:43:46	0.3410	1587.75	106.47
2363	2	9:43:53	0.3430	1587.62	106.47
2364	2	9:44: 4	0.3460	1587.49	106.47
2365	2	9:44:11	0.3480	1587.40	106.47
2366	2	9:44:22	0.3510	1587.31	106.47
2367	2	9:44:29	0.3530	1587.19	106.47
2368	2	9:44:40	0.3560	1587.12	106.47
2369	2	9:44:47	0.3580	1587.02	106.47
2370	2	9:44:58	0.3610	1586.93	106.47
2371	2	9:45: 9	0.3640	1586.79	106.47
2372	2	9:45:20	0.3670	1586.72	106.47
2373	2	9:45:27	0.3690	1586.63	106.47
2374	2	9:45:38	0.3720	1586.55	106.47
2375	2	9:45:45	0.3740	1586.49	106.47
2376	2	9:45:56	0.3770	1586.41	106.47
2377	2	9:46: 3	0.3790	1586.34	106.47
2378	2	9:46:14	0.3820	1586.27	106.47
2379	2	9:46:21	0.3840	1586.22	106.47
2380	2	9:46:32	0.3870	1586.16	106.47
2381	2	9:46:39	0.3890	1586.09	106.48

[ECO SOLUTIONS, INC.]

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

[Friday: Feb. 18, 1994]
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg. F)
2382	2	9:46:50	0.3920	1586.03	106.48
2383	2	9:46:57	0.3940	1585.97	106.48
2384	2	9:47:15	0.3990	1585.87	106.48
2385	2	9:47:22	0.4010	1585.81	106.48
2386	2	9:47:33	0.4040	1585.76	106.48
2387	2	9:47:40	0.4060	1585.70	106.47
2388	2	9:47:51	0.4090	1585.65	106.48
2389	2	9:47:58	0.4110	1585.60	106.48
2390	2	9:48: 9	0.4140	1585.54	106.48
2391	2	9:48:16	0.4160	1585.49	106.48
2392	2	9:48:27	0.4190	1585.43	106.48
2393	2	9:48:34	0.4210	1585.40	106.48
2394	2	9:48:45	0.4240	1585.35	106.48
2395	2	9:48:52	0.4260	1585.29	106.48
2396	2	9:49: 6	0.4300	1585.25	106.48
2397	2	9:49:14	0.4320	1585.18	106.48
2398	2	9:49:24	0.4350	1585.15	106.48
2399	2	9:49:32	0.4370	1585.12	106.48
2400	2	9:49:42	0.4400	1585.07	106.48
2402	2	9:50: 0	0.4450	1585.01	106.48
2404	2	9:50:18	0.4500	1584.94	106.48
2406	2	9:50:36	0.4550	1584.87	106.48
2408	2	9:50:54	0.4600	1584.82	106.48
2410	2	9:51:20	0.4670	1584.71	106.48
2412	2	9:51:38	0.4720	1584.66	106.48
2414	2	9:51:56	0.4770	1584.60	106.48
2416	2	9:52:14	0.4820	1584.54	106.48
2418	2	9:52:32	0.4870	1584.50	106.49
2420	2	9:52:50	0.4920	1584.44	106.49
2422	2	9:53:15	0.4990	1584.38	106.49
2424	2	9:53:33	0.5040	1584.32	106.49
2426	2	9:53:51	0.5090	1584.28	106.49
2428	2	9:54: 9	0.5140	1584.24	106.49
2430	2	9:54:27	0.5190	1584.19	106.49
2432	2	9:54:45	0.5240	1584.14	106.49
2434	2	9:55: 6	0.5300	1584.06	106.48
2436	2	9:55:24	0.5350	1584.02	106.48
2438	2	9:55:42	0.5400	1583.97	106.48
2440	2	9:56: 0	0.5450	1583.94	106.48
2442	2	9:56:18	0.5500	1583.89	106.47
2444	2	9:56:36	0.5550	1583.86	106.47
2446	2	9:57: 2	0.5620	1583.80	106.47
2448	2	9:57:20	0.5670	1583.76	106.46
2450	2	9:57:38	0.5720	1583.73	106.46
2452	2	9:57:56	0.5770	1583.70	106.46
2454	2	9:58:14	0.5820	1583.67	106.46
2456	2	9:58:32	0.5870	1583.65	106.46
2458	2	9:58:50	0.5920	1583.62	106.45
2460	2	9:59:11	0.5980	1583.59	106.46
2462	2	9:59:29	0.6030	1583.54	106.46
2464	2	9:59:47	0.6080	1583.52	106.46
2466	2	10: 0: 5	0.6130	1583.49	106.47
2468	2	10: 0:23	0.6180	1583.46	106.47
2470	2	10: 0:41	0.6230	1583.43	106.47
2472	2	10: 1: 3	0.6290	1583.40	106.47

Company: HOECHST CELANESE CORPORATION
Well: WDW-14 WELL #2
Field: BAY CITY FACILITY, TEXAS

[Friday: Feb. 18, 1994]
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
2474	2	10: 1:21	0.6340	1583.37	106.47
2476	2	10: 1:39	0.6390	1583.35	106.48
2478	2	10: 1:57	0.6440	1583.32	106.48
2480	2	10: 2:15	0.6490	1583.29	106.49
2482	2	10: 2:33	0.6540	1583.26	106.49
2484	2	10: 2:54	0.6600	1583.21	106.49
2486	2	10: 3:12	0.6650	1583.20	106.49
2488	2	10: 3:30	0.6700	1583.17	106.49
2490	2	10: 3:48	0.6750	1583.15	106.49
2492	2	10: 4: 6	0.6800	1583.12	106.49
2494	2	10: 4:39	0.6890	1583.04	106.49
2496	2	10: 5:11	0.6980	1583.01	106.49
2498	2	10: 5:40	0.7060	1582.94	106.50
2500	2	10: 6: 9	0.7140	1582.91	106.50
2502	2	10: 6:38	0.7220	1582.86	106.51
2504	2	10: 7: 6	0.7300	1582.83	106.51
2506	2	10: 7:35	0.7380	1582.80	106.51
2508	2	10: 8: 4	0.7460	1582.77	106.52
2510	2	10: 8:36	0.7550	1582.71	106.53
2512	2	10: 9: 5	0.7630	1582.69	106.53
2514	2	10: 9:34	0.7710	1582.65	106.53
2516	2	10:10: 3	0.7790	1582.63	106.53
2518	2	10:10:32	0.7870	1582.58	106.53
2520	2	10:11: 0	0.7950	1582.55	106.54
2522	2	10:11:33	0.8040	1582.52	106.53
2524	2	10:12: 2	0.8120	1582.48	106.54
2526	2	10:12:30	0.8200	1582.46	106.54
2528	2	10:12:59	0.8280	1582.43	106.54
2530	2	10:13:28	0.8360	1582.41	106.54
2532	2	10:13:57	0.8440	1582.37	106.54
2534	2	10:14:26	0.8520	1582.34	106.53
2536	2	10:14:54	0.8600	1582.32	106.54
2538	2	10:15:27	0.8690	1582.31	106.55
2540	2	10:15:56	0.8770	1582.29	106.56
2542	2	10:16:21	0.8840	1582.27	106.57
2544	2	10:16:50	0.8920	1582.25	106.58
2546	2	10:17:22	0.9010	1582.21	106.58
2548	2	10:17:51	0.9090	1582.19	106.58
2550	2	10:18:20	0.9170	1582.16	106.59
2552	2	10:18:48	0.9250	1582.13	106.59
2554	2	10:19:17	0.9330	1582.10	106.59
2556	2	10:19:46	0.9410	1582.06	106.59
2558	2	10:20:15	0.9490	1582.04	106.58
2560	2	10:20:47	0.9580	1582.01	106.57
2562	2	10:21:16	0.9660	1581.98	106.57
2564	2	10:21:45	0.9740	1581.96	106.57
2566	2	10:22:14	0.9820	1581.94	106.57
2568	2	10:22:42	0.9900	1581.92	106.56
2570	2	10:23:11	0.9980	1581.92	106.57
2572	2	10:23:40	1.0060	1581.95	106.60
2574	2	10:24: 9	1.0140	1581.92	106.61
2576	2	10:24:38	1.0220	1581.89	106.62
2578	2	10:25: 6	1.0300	1581.85	106.62
2580	2	10:25:39	1.0390	1581.81	106.63
2582	2	10:26: 4	1.0460	1581.77	106.62

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
2584	2	10:26:36	1.0550	1581.74	106.61
2586	2	10:27: 9	1.0640	1581.72	106.61
2588	2	10:27:38	1.0720	1581.70	106.60
2590	2	10:28: 6	1.0800	1581.69	106.60
2592	2	10:28:32	1.0870	1581.68	106.60
2594	2	10:29: 0	1.0950	1581.66	106.60
2596	2	10:29:51	1.1090	1581.60	106.60
2598	2	10:30:30	1.1200	1581.57	106.60
2600	2	10:31:14	1.1320	1581.53	106.60
2602	2	10:32: 0	1.1450	1581.51	106.61
2604	2	10:32:44	1.1570	1581.48	106.60
2606	2	10:33:27	1.1690	1581.44	106.61
2608	2	10:34: 6	1.1800	1581.41	106.59
2610	2	10:34:52	1.1926	1581.40	106.59
2612	2	10:35:35	1.2046	1581.37	106.59
2614	2	10:36:18	1.2166	1581.35	106.60
2616	2	10:37: 1	1.2286	1581.31	106.59
2618	2	10:37:44	1.2406	1581.29	106.58
2620	2	10:38:28	1.2526	1581.26	106.58
2622	2	10:39:11	1.2646	1581.24	106.58
2624	2	10:39:54	1.2766	1581.21	106.57
2626	2	10:40:37	1.2886	1581.19	106.57
2628	2	10:41:20	1.3006	1581.17	106.56
2630	2	10:42: 4	1.3126	1581.16	105.56
2632	2	10:42:47	1.3246	1581.14	106.57
2634	2	10:43:30	1.3366	1581.13	106.57
2636	2	10:44:13	1.3486	1581.13	106.58
2638	2	10:44:56	1.3606	1581.08	106.59
2640	2	10:45:40	1.3726	1581.05	106.58
2642	2	10:46:23	1.3846	1581.03	106.58
2644	2	10:47: 6	1.3966	1581.02	106.59
2646	2	10:47:49	1.4086	1581.00	106.59
2648	2	10:48:32	1.4206	1581.00	106.61
2650	2	10:49:16	1.4326	1580.97	106.62
2652	2	10:49:59	1.4446	1580.93	106.62
2654	2	10:50:42	1.4566	1580.92	106.62
2656	2	10:51:25	1.4686	1580.89	106.61
2658	2	10:52: 8	1.4806	1580.86	106.61
2660	2	10:52:52	1.4926	1580.84	106.60
2662	2	10:53:35	1.5046	1580.84	106.61
2664	2	10:54:18	1.5166	1580.81	106.60
2666	2	10:55: 1	1.5286	1580.80	106.60
2668	2	10:55:44	1.5406	1580.77	106.60
2670	2	10:56:28	1.5526	1580.75	106.59
2672	2	10:57:11	1.5646	1580.74	106.59
2674	2	10:57:54	1.5766	1580.71	106.59
2676	2	10:58:37	1.5886	1580.70	106.58
2678	2	10:59:20	1.6006	1580.70	106.59
2680	2	11: 0: 4	1.6126	1580.68	106.59
2682	2	11: 0:47	1.6246	1580.65	106.59
2684	2	11: 1:30	1.6366	1580.65	106.60
2686	2	11: 2:13	1.6486	1580.65	106.61
2688	2	11: 2:56	1.6606	1580.63	106.62
2690	2	11: 3:40	1.6726	1580.60	106.62
2692	2	11: 4:23	1.6846	1580.57	106.62

[ECO SOLUTIONS, INC.]

Company: HOECHST CELANESE CORPORATION
Well: WDW-14 WELL #2
Field: BAY CITY FACILITY, TEXAS

[Friday: Feb. 18, 1994]
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
2694	2	11: 5: 6	1.6966	1580.54	106.61
2696	2	11: 5:49	1.7086	1580.53	106.61
2698	2	11: 6:32	1.7206	1580.52	106.61
2700	2	11: 7:16	1.7326	1580.50	106.61
2702	2	11: 7:59	1.7446	1580.49	106.61
2704	2	11: 8:42	1.7566	1580.48	106.61
2706	2	11: 9:25	1.7686	1580.47	106.61
2708	2	11:10: 8	1.7806	1580.45	106.61
2710	2	11:10:52	1.7926	1580.43	106.61
2712	2	11:11:35	1.8046	1580.42	106.61
2714	2	11:12:18	1.8166	1580.40	106.61
2716	2	11:13: 1	1.8286	1580.39	106.61
2718	2	11:13:44	1.8406	1580.39	106.63
2720	2	11:14:28	1.8526	1580.36	106.63
2722	2	11:15:11	1.8646	1580.33	106.63
2724	2	11:15:54	1.8766	1580.32	106.63
2726	2	11:16:37	1.8886	1580.31	106.63
2728	2	11:17:20	1.9006	1580.31	106.64
2730	2	11:18: 4	1.9126	1580.30	106.65
2732	2	11:18:47	1.9246	1580.27	106.65
2734	2	11:19:30	1.9366	1580.25	106.64
2736	2	11:20:13	1.9486	1580.24	106.64
2738	2	11:20:56	1.9606	1580.23	106.64
2740	2	11:21:40	1.9726	1580.22	106.65
2742	2	11:22:23	1.9846	1580.21	106.65
2744	2	11:23: 6	1.9966	1580.21	106.66
2746	2	11:23:49	2.0086	1580.18	106.66
2748	2	11:24:32	2.0206	1580.16	106.66
2750	2	11:26:18	2.0499	1580.10	106.66
2752	2	11:27:16	2.0660	1580.08	106.66
2754	2	11:28:13	2.0820	1580.07	106.66
2756	2	11:29:11	2.0980	1580.06	106.67
2758	2	11:30: 9	2.1140	1580.04	106.67
2760	2	11:31: 6	2.1300	1580.03	106.68
2762	2	11:32: 4	2.1460	1580.00	106.68
2764	2	11:33: 1	2.1620	1577.99	106.68
2766	2	11:33:59	2.1780	1579.98	106.68
2768	2	11:34:57	2.1940	1579.96	106.69
2770	2	11:35:54	2.2100	1579.93	106.69
2772	2	11:36:52	2.2260	1579.91	106.67
2774	2	11:37:49	2.2420	1579.90	106.67
2776	2	11:38:47	2.2580	1579.91	106.68
2778	2	11:39:45	2.2740	1579.88	106.70
2780	2	11:40:42	2.2900	1579.85	106.69
2782	2	11:41:40	2.3060	1579.84	106.69
2784	2	11:42:37	2.3220	1579.82	106.69
2786	2	11:43:35	2.3380	1579.81	106.69
2788	2	11:44:33	2.3540	1579.80	106.69
2790	2	11:45:30	2.3700	1579.79	106.69
2792	2	11:46:28	2.3860	1579.78	106.70
2794	2	11:47:25	2.4020	1579.75	106.71
2796	2	11:48:23	2.4180	1579.73	106.70
2798	2	11:49:21	2.4340	1579.73	106.70
2800	2	11:50:18	2.4500	1579.73	106.72
2802	2	11:51:16	2.4660	1579.72	106.73

Company: HOECHST CELANESE CORPORATION
Well: WDW-14 WELL #2
Field: BAY CITY FACILITY, TEXAS

[Friday: Feb. 18, 1994]
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
2804	2	11:52:13	2.4820	1579.69	106.73
2806	2	11:53:11	2.4980	1579.68	106.74
2808	2	11:54: 9	2.5140	1579.66	106.74
2810	2	11:55: 6	2.5300	1579.65	106.74
2812	2	11:56: 4	2.5460	1579.62	106.74
2814	2	11:57: 1	2.5620	1579.62	106.74
2816	2	11:57:59	2.5780	1579.60	106.74
2818	2	11:58:57	2.5940	1579.58	106.74
2820	2	11:59:54	2.6100	1579.56	106.74
2822	2	12: 0:52	2.6260	1579.56	106.74
2824	2	12: 1:49	2.6420	1579.53	106.73
2826	2	12: 2:47	2.6580	1579.52	106.73
2828	2	12: 3:45	2.6741	1579.52	106.73
2830	2	12: 4:43	2.6901	1579.51	106.73
2832	2	12: 5:40	2.7061	1579.49	106.73
2834	2	12: 6:38	2.7221	1579.48	106.73
2836	2	12: 7:35	2.7381	1579.46	106.73
2838	2	12: 8:33	2.7541	1579.45	106.72
2840	2	12: 9:31	2.7701	1579.43	106.72
2842	2	12:10:28	2.7861	1579.43	106.72
2844	2	12:11:26	2.8021	1579.42	106.72
2846	2	12:12:23	2.8181	1579.42	106.73
2848	2	12:13:21	2.8341	1579.42	106.74
2850	2	12:14:19	2.8501	1579.38	106.74
2852	2	12:15:16	2.8661	1579.37	106.73
2854	2	12:16:14	2.8821	1579.35	106.73
2856	2	12:17:11	2.8981	1579.34	106.73
2858	2	12:19:58	2.9443	1579.28	106.73
2860	2	12:20:55	2.9603	1579.28	106.74
2862	2	12:21:53	2.9763	1579.27	106.74
2864	2	12:22:51	2.9923	1579.26	106.73
2866	2	12:23:48	3.0083	1579.26	106.74
2868	2	12:24:46	3.0243	1579.25	106.73
2870	2	12:25:43	3.0403	1579.25	106.75
2872	2	12:26:41	3.0563	1579.23	106.75
2874	2	12:27:39	3.0723	1579.24	106.76
2876	2	12:28:36	3.0883	1579.22	106.78
2878	2	12:29:34	3.1043	1579.20	106.78
2880	2	12:30:31	3.1203	1579.20	106.78
2882	2	12:31:29	3.1363	1579.19	106.79
2884	2	12:32:27	3.1523	1579.17	106.79
2886	2	12:33:24	3.1683	1579.15	106.79
2888	2	12:34:22	3.1843	1579.14	106.79
2890	2	12:35:19	3.2003	1579.12	106.78
2892	2	12:36:17	3.2163	1579.12	106.78
2894	2	12:37:15	3.2323	1579.10	106.78
2896	2	12:38:12	3.2483	1579.09	106.77
2898	2	12:39:10	3.2643	1579.08	106.77
2900	2	12:40: 7	3.2803	1579.07	106.77
2902	2	12:41: 5	3.2963	1579.06	106.77
2904	2	12:42: 3	3.3123	1579.05	106.77
2906	2	12:43: 0	3.3283	1579.05	106.77
2908	2	12:43:58	3.3443	1579.05	106.79
2910	2	12:44:55	3.3603	1579.03	106.80
2912	2	12:45:53	3.3763	1579.02	106.80

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

[Friday: Feb. 18, 1994]
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
2914	2	12:46:51	3.3923	1579.00	106.80
2916	2	12:47:48	3.4083	1578.99	106.80
2918	2	12:48:46	3.4243	1578.97	106.79
2920	2	12:49:43	3.4403	1578.96	106.78
2922	2	12:50:41	3.4563	1578.98	106.80
2924	2	12:51:39	3.4723	1578.97	106.81
2926	2	12:52:36	3.4883	1578.95	106.81
2928	2	12:53:34	3.5043	1578.94	106.81
2930	2	12:54:31	3.5203	1578.94	106.82
2932	2	12:55:29	3.5363	1578.91	106.82
2934	2	12:56:27	3.5523	1578.90	106.81
2936	2	12:57:24	3.5683	1578.88	106.80
2938	2	12:58:22	3.5843	1578.89	106.81
2940	2	12:59:19	3.6003	1578.86	106.80
2942	2	13: 0:17	3.6163	1578.84	106.78
2944	2	13: 1:15	3.6323	1578.83	106.78
2946	2	13: 2:12	3.6483	1578.84	106.78
2948	2	13: 3:10	3.6643	1578.83	106.78
2950	2	13: 4: 7	3.6803	1578.82	106.78
2952	2	13: 5: 5	3.6963	1578.81	106.79
2954	2	13: 6: 3	3.7123	1578.82	106.80
2956	2	13: 7: 0	3.7283	1578.80	106.80
2958	2	13: 7:58	3.7443	1578.79	106.79
2960	2	13: 8:55	3.7603	1578.77	106.78
2962	2	13: 9:53	3.7763	1578.77	106.78
2964	2	13:10:51	3.7923	1578.77	106.79
2966	2	13:11:48	3.8083	1578.76	106.80
2968	2	13:12:46	3.8243	1578.75	106.80
2970	2	13:13:43	3.8403	1578.75	106.81
2972	2	13:14:41	3.8563	1578.73	106.82
2974	2	13:15:39	3.8723	1578.71	106.81
2976	2	13:16:36	3.8883	1578.69	106.80
2978	2	13:17:34	3.9043	1578.70	106.80
2980	2	13:18:31	3.9203	1578.68	106.80
2982	2	13:19:29	3.9363	1578.67	106.80
2984	2	13:20:27	3.9523	1578.66	106.79
2986	2	13:21:24	3.9683	1578.65	106.79
2988	2	13:24: 5	4.0129	1578.64	106.83
2990	2	13:25: 2	4.0289	1578.64	106.83
2992	2	13:26: 0	4.0449	1578.62	106.83
2994	2	13:26:58	4.0609	1578.62	106.84
2996	2	13:27:55	4.0769	1578.62	106.85
2998	2	13:28:53	4.0929	1578.60	106.85
3000	2	13:29:50	4.1089	1578.58	106.84
3002	2	13:30:48	4.1249	1578.58	106.83
3004	2	13:31:46	4.1409	1578.58	106.84
3006	2	13:32:43	4.1569	1578.57	106.84
3008	2	13:33:41	4.1729	1578.55	106.84
3010	2	13:34:38	4.1889	1578.54	106.84
3012	2	13:35:36	4.2049	1578.52	106.82
3014	2	13:36:34	4.2209	1578.53	106.82
3016	2	13:37:31	4.2369	1578.52	106.82
3018	2	13:38:29	4.2529	1578.51	106.82
3020	2	13:39:26	4.2689	1578.52	106.83
3022	2	13:40:24	4.2849	1578.53	106.85

Company: HOECHST CELANESE CORPORATION
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
3024	2	13:41:22	4.3009	1578.50	106.86
3026	2	13:42:19	4.3169	1578.49	106.85
3028	2	13:43:17	4.3329	1578.47	106.86
3030	2	13:44:14	4.3489	1578.46	106.84
3032	2	13:45:12	4.3649	1578.46	106.84
3034	2	13:46:10	4.3809	1578.48	106.86
3036	2	13:47: 7	4.3969	1578.48	106.87
3038	2	13:48: 5	4.4129	1578.46	106.88
3040	2	13:49: 2	4.4289	1578.43	106.88
3042	2	13:50: 0	4.4449	1578.43	106.88
3044	2	13:50:58	4.4609	1578.42	106.88
3046	2	13:51:55	4.4769	1578.41	106.88
3048	2	13:52:53	4.4929	1578.40	106.88
3050	2	13:53:50	4.5089	1578.40	106.89
3052	2	13:54:48	4.5249	1578.39	106.89
3054	2	13:55:46	4.5409	1578.37	106.88
3056	2	13:56:43	4.5569	1578.37	106.88
3058	2	13:57:41	4.5729	1578.35	106.89
3060	2	13:58:38	4.5889	1578.34	106.88
3062	2	13:59:36	4.6049	1578.34	106.87
3064	2	14: 0:34	4.6209	1578.32	106.87
3066	2	14: 1:31	4.6369	1578.31	106.86
3068	2	14: 2:29	4.6529	1578.31	106.85
3070	2	14: 3:26	4.6689	1578.31	106.86
3072	2	14: 4:24	4.6849	1578.31	106.86
3074	2	14: 5:22	4.7009	1578.29	106.86
3076	2	14: 6:19	4.7169	1578.28	106.86
3078	2	14: 7:17	4.7329	1578.29	106.87
3080	2	14: 8:14	4.7489	1578.29	106.87
3082	2	14: 9:12	4.7649	1578.27	106.87
3084	2	14:10:10	4.7809	1578.26	106.86
3086	2	14:11: 7	4.7969	1578.25	106.86
3088	2	14:12: 5	4.8129	1578.25	106.87
3090	2	14:13: 2	4.8289	1578.24	106.87
3092	2	14:14: 0	4.8449	1578.23	106.87
3094	2	14:14:58	4.8609	1578.22	106.87
3096	2	14:15:55	4.8769	1578.21	106.86
3098	2	14:16:53	4.8929	1578.20	106.86
3100	2	14:17:50	4.9089	1578.20	106.86
3102	2	14:18:48	4.9249	1578.19	106.85
3104	2	14:19:46	4.9409	1578.18	106.85
3106	2	14:20:43	4.9569	1578.18	106.85
3108	2	14:21:41	4.9729	1578.18	106.85
3110	2	14:22:38	4.9889	1578.19	106.86
3112	2	14:23:36	5.0049	1578.18	106.87
3114	2	14:24:34	5.0209	1578.17	106.87
3116	2	14:25:31	5.0369	1578.16	106.87
3118	2	14:26:29	5.0529	1578.14	106.88
3120	2	14:27:26	5.0689	1578.12	106.88
3122	2	14:28:24	5.0849	1578.12	106.86
3124	2	14:29:22	5.1009	1578.11	106.85
3126	2	14:30:19	5.1169	1578.12	106.85
3128	2	14:31:17	5.1329	1578.11	106.86
3130	2	14:32:14	5.1489	1578.11	106.86
3132	2	14:33:12	5.1649	1578.11	106.87

Company: HOECHST CELANESE CORPORATION
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
3134	2	14:34:10	5.1809	1578.10	106.88
3136	2	14:35: 7	5.1969	1578.09	106.88
3138	2	14:36: 5	5.2129	1578.07	106.87
3140	2	14:37: 2	5.2289	1578.06	106.87
3142	2	14:38: 0	5.2449	1578.06	106.87
3144	2	14:38:58	5.2609	1578.06	106.87
3146	2	14:39:55	5.2769	1578.05	106.87
3148	2	14:40:53	5.2929	1578.05	106.87
3150	2	14:41:50	5.3089	1578.05	106.88
3152	2	14:42:48	5.3249	1578.04	106.89
3154	2	14:43:46	5.3409	1578.03	106.89
3156	2	14:44:43	5.3569	1578.02	106.88
3158	2	14:45:41	5.3729	1578.01	106.89
3160	2	14:46:38	5.3889	1578.00	106.88
3162	2	14:47:36	5.4049	1578.00	106.89
3164	2	14:48:34	5.4209	1578.00	106.89
3166	2	14:49:31	5.4369	1577.99	106.89
3168	2	14:50:29	5.4529	1577.97	106.89
3170	2	14:51:26	5.4689	1577.97	106.88
3172	2	14:52:24	5.4849	1577.96	106.87
3174	2	14:53:22	5.5009	1577.95	106.87
3176	2	14:54:19	5.5169	1577.94	106.86
3178	2	14:55:17	5.5329	1577.95	106.86
3180	2	14:56:14	5.5489	1577.96	106.87
3182	2	14:57:12	5.5649	1577.94	106.87
3184	2	14:58:10	5.5809	1577.94	106.88
3186	2	14:59: 7	5.5969	1577.93	106.88
3188	2	15: 0: 5	5.6129	1577.92	106.88
3190	2	15: 1: 2	5.6289	1577.92	106.89
3192	2	15: 2: 0	5.6449	1577.89	106.88
3194	2	15: 2:58	5.6609	1577.89	106.87
3196	2	15: 3:55	5.6769	1577.89	106.87
3198	2	15: 4:53	5.6929	1577.88	106.87
3200	2	15: 5:50	5.7089	1577.89	106.88
3202	2	15: 6:48	5.7249	1577.88	106.88
3204	2	15: 7:46	5.7409	1577.88	106.89
3206	2	15: 8:43	5.7569	1577.87	106.89
3208	2	15: 9:41	5.7729	1577.87	106.89
3210	2	15:10:38	5.7889	1577.86	106.90
3212	2	15:11:36	5.8049	1577.85	106.90
3214	2	15:12:34	5.8209	1577.85	106.90
3216	2	15:13:31	5.8369	1577.85	106.89
3218	2	15:14:29	5.8529	1577.83	106.89
3220	2	15:15:26	5.8689	1577.83	106.90
3222	2	15:16:24	5.8849	1577.82	106.89
3224	2	15:17:22	5.9009	1577.83	106.90
3226	2	15:18:19	5.9169	1577.82	106.91
3228	2	15:19:17	5.9329	1577.81	106.91
3230	2	15:20:14	5.9489	1577.80	106.91
3232	2	15:21:12	5.9649	1577.78	106.90
3234	2	15:22:10	5.9809	1577.78	106.89
3236	2	15:23: 7	5.9969	1577.78	106.90
3238	2	15:24: 5	6.0129	1577.78	106.90
3240	2	15:25: 2	6.0289	1577.77	106.90
3242	2	15:26: 0	6.0449	1577.75	106.90

Company: HOECHST CELANESE CORPORATION
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg. F)
3244	2	15:26:58	6.0609	1577.76	106.91
3246	2	15:27:55	6.0769	1577.74	106.90
3248	2	15:28:53	6.0929	1577.74	106.89
3250	2	15:29:50	6.1089	1577.73	106.89
3252	2	15:30:48	6.1249	1577.73	106.89
3254	2	15:31:46	6.1409	1577.71	106.88
3256	2	15:32:43	6.1569	1577.71	106.87
3258	2	15:33:41	6.1729	1577.73	106.88
3260	2	15:34:38	6.1889	1577.72	106.89
3262	2	15:35:36	6.2049	1577.72	106.90
3264	2	15:36:34	6.2209	1577.72	106.91
3266	2	15:37:31	6.2369	1577.71	106.91
3268	2	15:38:29	6.2529	1577.70	106.90
3270	2	15:39:26	6.2689	1577.69	106.91
3272	2	15:40:24	6.2849	1577.69	106.92
3274	2	15:41:22	6.3009	1577.68	106.92
3276	2	15:42:19	6.3169	1577.69	106.93
3278	2	15:43:17	6.3329	1577.69	106.93
3280	2	15:44:14	6.3489	1577.66	106.93
3282	2	15:45:12	6.3649	1577.65	106.93
3284	2	15:46:10	6.3809	1577.65	106.92
3286	2	15:47: 7	6.3969	1577.65	106.92
3288	2	15:48: 5	6.4129	1577.62	106.92
3290	2	15:49: 2	6.4289	1577.60	106.90
3292	2	15:50: 0	6.4449	1577.61	106.89
3294	2	15:50:58	6.4609	1577.61	106.88
3296	2	15:51:55	6.4769	1577.62	106.88
3298	2	15:52:53	6.4929	1577.61	106.88
3300	2	15:53:50	6.5089	1577.61	106.88
3302	2	15:54:48	6.5249	1577.59	106.88
3304	2	15:55:46	6.5409	1577.59	106.88
3306	2	15:56:43	6.5569	1577.59	106.87
3308	2	15:57:41	6.5729	1577.59	106.88
3310	2	15:58:38	6.5889	1577.59	106.88
3312	2	15:59:36	6.6049	1577.59	106.89
3314	2	16: 0:34	6.6209	1577.59	106.90
3316	2	16: 1:31	6.6369	1577.58	106.91
3318	2	16: 2:29	6.6529	1577.57	106.91
3320	2	16: 3:26	6.6689	1577.57	106.91
3322	2	16: 4:24	6.6849	1577.56	106.92
3324	2	16: 5:22	6.7009	1577.55	106.91
3326	2	16: 6:19	6.7169	1577.54	106.91
3328	2	16: 7:17	6.7329	1577.53	106.91
3330	2	16: 8:14	6.7489	1577.53	106.90
3332	2	16: 9:12	6.7649	1577.52	106.90
3334	2	16:10:10	6.7809	1577.52	106.90
3336	2	16:11: 7	6.7969	1577.52	106.91
3338	2	16:12: 5	6.8129	1577.51	106.91
3340	2	16:13: 2	6.8289	1577.51	106.91
3342	2	16:14: 0	6.8449	1577.50	106.91
3344	2	16:14:58	6.8609	1577.51	106.92
3346	2	16:15:55	6.8769	1577.51	106.93
3348	2	16:16:53	6.8929	1577.49	106.93
3350	2	16:17:50	6.9089	1577.48	106.92
3352	2	16:18:48	6.9249	1577.48	106.92

Company: HOECHST CELANESE CORPORATION
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
3354	2	16:19:46	6.9409	1577.46	106.92
3356	2	16:20:43	6.9569	1577.47	106.92
3358	2	16:21:41	6.9729	1577.46	106.91
3360	2	16:22:38	6.9889	1577.45	106.90
3362	2	16:23:36	7.0049	1577.46	106.90
3364	2	16:24:34	7.0209	1577.45	106.90
3366	2	16:25:31	7.0369	1577.44	106.91
3368	2	16:26:29	7.0529	1577.43	106.91
3370	2	16:27:26	7.0689	1577.42	106.91
3372	2	16:28:24	7.0849	1577.43	106.91
3374	2	16:29:22	7.1009	1577.43	106.92
3376	2	16:30:19	7.1169	1577.43	106.92
3378	2	16:31:17	7.1329	1577.42	106.93
3380	2	16:32:14	7.1489	1577.40	106.93
3382	2	16:33:12	7.1649	1577.39	106.91
3384	2	16:34:10	7.1809	1577.38	106.91
3386	2	16:35: 7	7.1969	1577.38	106.90
3388	2	16:36: 5	7.2129	1577.39	106.91
3390	2	16:37: 2	7.2289	1577.40	106.92
3392	2	16:38: 0	7.2449	1577.39	106.92
3394	2	16:38:58	7.2609	1577.37	106.92
3396	2	16:39:55	7.2769	1577.37	106.92
3398	2	16:40:53	7.2929	1577.36	106.92
3400	2	16:41:50	7.3089	1577.36	106.92
3402	2	16:42:48	7.3249	1577.36	106.92
3404	2	16:43:46	7.3409	1577.35	106.91
3406	2	16:44:43	7.3569	1577.34	106.90
3408	2	16:45:41	7.3729	1577.34	106.90
3410	2	16:46:38	7.3889	1577.34	106.91
3412	2	16:47:36	7.4049	1577.35	106.91
3414	2	16:48:34	7.4209	1577.34	106.93
3416	2	16:49:31	7.4369	1577.33	106.93
3418	2	16:50:29	7.4529	1577.32	106.93
3420	2	16:51:26	7.4689	1577.32	106.93
3422	2	16:52:24	7.4849	1577.31	106.93
3424	2	16:53:22	7.5009	1577.30	106.93
3426	2	16:54:19	7.5169	1577.29	106.92
3428	2	16:55:17	7.5329	1577.29	106.91
3430	2	16:56:14	7.5489	1577.28	106.91
3432	2	16:57:12	7.5649	1577.29	106.92
3434	2	16:58:10	7.5809	1577.28	106.92
3436	2	16:59: 7	7.5969	1577.29	106.92
3438	2	17: 0: 5	7.6129	1577.28	106.93
3440	2	17: 1: 2	7.6289	1577.26	106.92
3442	2	17: 2: 0	7.6449	1577.26	106.92
3444	2	17: 2:58	7.6609	1577.26	106.92
3446	2	17: 3:55	7.6769	1577.25	106.92
3448	2	17: 4:53	7.6929	1577.24	106.91
3450	2	17: 5:50	7.7089	1577.25	106.92
3452	2	17: 7:46	7.7410	1577.22	106.91
3454	2	17: 9:41	7.7730	1577.21	106.92
3456	2	17:11:36	7.8050	1577.19	106.93
3458	2	17:13:32	7.8370	1577.17	106.93
3460	2	17:15:27	7.8690	1577.16	106.91
3462	2	17:17:22	7.9010	1577.17	106.91

Company: HOECHST CELANESE CORPORATION
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
3464	2	17:19:17	7.9330	1577.18	106.93
3466	2	17:21:12	7.9650	1577.16	106.95
3468	2	17:23: 8	7.9970	1577.14	106.95
3470	2	17:25: 3	8.0290	1577.13	106.95
3472	2	17:26:58	8.0610	1577.12	106.94
3474	2	17:28:53	8.0930	1577.11	106.94
3476	2	17:30:48	8.1250	1577.10	106.94
3478	2	17:32:44	8.1570	1577.09	106.93
3480	2	17:34:39	8.1890	1577.08	106.94
3482	2	17:36:34	8.2210	1577.08	106.94
3484	2	17:38:29	8.2530	1577.07	106.94
3486	2	17:40:24	8.2850	1577.07	106.95
3488	2	17:43:18	8.3332	1577.06	106.96
3490	2	17:45:13	8.3652	1577.03	106.95
3492	2	17:47: 8	8.3972	1577.03	106.95
3494	2	17:49: 4	8.4292	1577.03	106.95
3496	2	17:50:59	8.4612	1577.04	106.96
3498	2	17:52:54	8.4932	1577.02	106.97
3500	2	17:54:49	8.5252	1577.00	106.96
3502	2	17:56:44	8.5572	1576.98	106.95
3504	2	17:58:40	8.5892	1576.98	106.94
3506	2	18: 0:35	8.6212	1576.97	106.93
3508	2	18: 2:30	8.6532	1576.98	106.94
3510	2	18: 4:25	8.6852	1576.98	106.95
3512	2	18: 6:20	8.7172	1576.95	106.94
3514	2	18: 8:16	8.7492	1576.95	106.95
3516	2	18:10:11	8.7812	1576.94	106.94
3518	2	18:12: 6	8.8132	1576.94	106.95
3520	2	18:14: 1	8.8452	1576.93	106.96
3522	2	18:15:56	8.8772	1576.92	106.96
3524	2	18:17:52	8.9092	1576.89	106.94
3526	2	18:19:47	8.9412	1576.89	106.93
3528	2	18:23:55	9.0102	1576.87	106.94
3530	2	18:25:50	9.0422	1576.87	106.95
3532	2	18:27:46	9.0742	1576.85	106.93
3534	2	18:29:41	9.1062	1576.87	106.94
3536	2	18:31:36	9.1382	1576.85	106.94
3538	2	18:33:31	9.1702	1576.84	106.94
3540	2	18:54:13	9.5152	1576.76	106.95
3542	2	18:56: 8	9.5472	1576.75	106.94
3544	2	18:58: 4	9.5792	1576.75	106.94
3546	2	18:59:59	9.6112	1576.73	106.94
3548	2	19: 1:54	9.6432	1576.74	106.93
3550	2	19: 3:49	9.6752	1576.75	106.95
3552	2	19: 5:44	9.7072	1576.73	106.97
3554	2	19: 7:40	9.7392	1576.71	106.97
3556	2	19: 9:35	9.7712	1576.70	106.95
3558	2	19:11:30	9.8032	1576.70	106.95
3560	2	19:13:25	9.8352	1576.69	106.95
3562	2	19:15:20	9.8672	1576.69	106.95
3564	2	19:17:16	9.8992	1576.67	106.95
3566	2	19:19:11	9.9312	1576.67	106.95
3568	2	19:21: 6	9.9632	1576.65	106.94
3570	2	19:23: 1	9.9952	1576.65	106.94
3572	2	19:24:56	10.0272	1576.64	106.94

[ECO SOLUTIONS, INC.]

Company: HOECHST CELANESE CORPORATION
Well: WDW-14 WELL #2
Field: BAY CITY FACILITY, TEXAS

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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
3574	2	19:26:52	10.0592	1576.64	106.95
3576	2	19:28:47	10.0912	1576.63	106.96
3578	2	19:30:42	10.1232	1576.63	106.95
3580	2	19:32:37	10.1552	1576.62	106.94
3582	2	19:34:32	10.1872	1576.61	106.94
3584	2	19:36:28	10.2192	1576.61	106.94
3586	2	19:38:23	10.2512	1576.59	106.94
3588	2	19:40:18	10.2832	1576.59	106.93
3590	2	19:42:13	10.3152	1576.58	106.93
3592	2	19:44: 8	10.3472	1576.59	106.96
3594	2	19:46: 4	10.3792	1576.56	106.95
3596	2	19:47:59	10.4112	1576.56	106.94
3598	2	19:49:54	10.4432	1576.56	106.94
3600	2	19:51:49	10.4752	1576.55	106.94
3602	2	19:53:44	10.5072	1576.54	106.94
3604	2	19:55:40	10.5392	1576.54	106.94
3606	2	19:57:35	10.5712	1576.53	106.94
3608	2	19:59:30	10.6032	1576.53	106.93
3610	2	20: 1:25	10.6352	1576.52	106.94
3612	2	20: 3:20	10.6672	1576.52	106.94
3614	2	20: 5:16	10.6992	1576.50	106.93
3616	2	20: 7:11	10.7312	1576.50	106.93
3618	2	20: 9: 6	10.7632	1576.51	106.94
3620	2	20:11: 1	10.7952	1576.50	106.95
3622	2	20:12:56	10.8272	1576.50	106.97
3624	2	20:14:52	10.8592	1576.48	106.96
3626	2	20:16:47	10.8912	1576.46	106.95
3628	2	20:18:42	10.9232	1576.46	106.95
3630	2	20:20:37	10.9552	1576.44	106.94
3632	2	20:22:32	10.9872	1576.44	106.93
3634	2	20:24:28	11.0192	1576.44	106.93
3636	2	20:26:23	11.0512	1576.44	106.93
3638	2	20:28:18	11.0832	1576.44	106.94
3640	2	20:30:13	11.1152	1576.42	106.94
3642	2	20:32: 8	11.1472	1576.41	106.94
3644	2	20:34: 4	11.1792	1576.40	106.93
3646	2	20:35:59	11.2112	1576.41	106.93
3648	2	20:37:54	11.2432	1576.39	106.93
3650	2	20:39:49	11.2752	1576.39	106.93
3652	2	20:41:44	11.3072	1576.40	106.94
3654	2	20:43:40	11.3392	1576.38	106.94
3656	2	20:45:35	11.3712	1576.38	106.95
3658	2	20:47:30	11.4032	1576.37	106.95
3660	2	20:49:25	11.4352	1576.36	106.94
3662	2	20:51:20	11.4672	1576.35	106.94
3664	2	20:53:16	11.4992	1576.35	106.94
3666	2	20:55:11	11.5312	1576.34	106.94
3668	2	20:57: 6	11.5632	1576.33	106.94
3670	2	20:59: 1	11.5952	1576.33	106.93
3672	2	21: 0:56	11.6272	1576.33	106.94
3674	2	21: 2:52	11.6592	1576.32	106.94
3676	2	21: 4:47	11.6912	1576.32	106.95
3678	2	21: 6:42	11.7232	1576.31	106.96
3680	2	21: 8:37	11.7552	1576.31	106.96
3682	2	21:10:32	11.7872	1576.30	106.96

Company: HOECHST CELANESE CORPORATION
Well: WDW-14 WELL #2
Field: BAY CITY FACILITY, TEXAS

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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
3684	2	21:12:28	11.8192	1576.28	106.95
3686	2	21:14:23	11.8512	1576.28	106.94
3688	2	21:16:18	11.8832	1576.27	106.94
3690	2	21:18:13	11.9152	1576.27	106.93
3692	2	21:20: 8	11.9472	1576.25	106.92
3694	2	21:22: 4	11.9792	1576.26	106.92
3696	2	21:23:59	12.0112	1576.26	106.93
3698	2	21:25:54	12.0432	1576.24	106.93
3700	2	21:27:49	12.0752	1576.24	106.93
3702	2	21:29:44	12.1072	1576.24	106.93
3704	2	21:31:40	12.1392	1576.24	106.93
3706	2	21:33:35	12.1712	1576.24	106.94
3708	2	21:35:30	12.2032	1576.23	106.95
3710	2	21:37:25	12.2352	1576.22	106.95
3712	2	21:39:20	12.2672	1576.21	106.96
3714	2	21:41:16	12.2992	1576.18	106.93
3716	2	21:43:11	12.3312	1576.19	106.92
3718	2	21:45: 6	12.3632	1576.18	106.92
3720	2	21:47: 1	12.3952	1576.18	106.92
3722	2	21:48:56	12.4272	1576.18	106.92
3724	2	21:50:52	12.4592	1576.17	106.92
3726	2	21:52:47	12.4912	1576.17	106.93
3728	2	21:54:42	12.5232	1576.16	106.93
3730	2	21:56:37	12.5552	1576.16	106.93
3732	2	21:58:32	12.5872	1576.15	106.93
3734	2	22: 0:28	12.6192	1576.14	106.93
3736	2	22: 2:23	12.6512	1576.14	106.94
3738	2	22: 4:18	12.6832	1576.13	106.93
3740	2	22: 6:13	12.7152	1576.12	106.93
3742	2	22: 8: 8	12.7472	1576.12	106.93
3744	2	22:10: 4	12.7792	1576.12	106.93
3746	2	22:11:59	12.8112	1576.11	106.93
3748	2	22:13:54	12.8432	1576.11	106.93
3750	2	22:15:49	12.8752	1576.09	106.93
3752	2	22:17:44	12.9072	1576.09	106.93
3754	2	22:19:40	12.9392	1576.09	106.94
3756	2	22:21:35	12.9712	1576.09	106.95
3758	2	22:23:30	13.0032	1576.08	106.94
3760	2	22:25:25	13.0352	1576.06	106.93
3762	2	22:27:20	13.0672	1576.06	106.93
3764	2	22:29:16	13.0992	1576.06	106.93
3766	2	22:31:11	13.1312	1576.05	106.93
3768	2	22:33: 6	13.1632	1576.06	106.93
3770	2	22:35: 1	13.1952	1576.06	106.94
3772	2	22:36:56	13.2272	1576.05	106.95
3774	2	22:38:52	13.2592	1576.03	106.95
3776	2	22:40:47	13.2912	1576.02	106.94
3778	2	22:42:42	13.3232	1576.02	106.93
3780	2	22:44:37	13.3552	1576.02	106.93
3782	2	22:46:32	13.3872	1576.02	106.93
3784	2	22:48:28	13.4192	1576.01	106.94
3786	2	22:50:23	13.4512	1576.02	106.94
3788	2	22:52:18	13.4832	1576.01	106.96
3790	2	22:54:13	13.5152	1575.99	106.96
3792	2	22:56: 8	13.5472	1575.98	106.95

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
3794	2	22:58: 4	13.5792	1575.97	106.94
3796	2	22:59:59	13.6112	1575.96	106.93
3798	2	23: 1:54	13.6432	1575.97	106.92
3800	2	23: 3:49	13.6752	1575.96	106.93
3802	2	23: 5:44	13.7072	1575.96	106.93
3804	2	23: 7:40	13.7392	1575.95	106.93
3806	2	23: 9:35	13.7712	1575.94	106.93
3808	2	23:11:30	13.8032	1575.94	106.93
3810	2	23:13:25	13.8352	1575.94	106.93
3812	2	23:15:20	13.8672	1575.94	106.93
3814	2	23:17:16	13.8992	1575.93	106.93
3816	2	23:19:11	13.9312	1575.93	106.93
3818	2	23:21: 6	13.9632	1575.91	106.93
3820	2	23:23: 1	13.9952	1575.91	106.93
3822	2	23:24:56	14.0272	1575.90	106.92
3824	2	23:26:52	14.0592	1575.91	106.92
3826	2	23:28:47	14.0912	1575.90	106.92
3828	2	23:30:42	14.1232	1575.90	106.93
3830	2	23:32:37	14.1552	1575.90	106.93
3832	2	23:34:32	14.1872	1575.89	106.93
3834	2	23:36:28	14.2192	1575.88	106.94
3836	2	23:38:23	14.2512	1575.86	106.93
3838	2	23:40:18	14.2832	1575.87	106.92
3840	2	23:42:13	14.3152	1575.86	106.92
3842	2	23:44: 8	14.3472	1575.85	106.91
3844	2	23:46: 4	14.3792	1575.85	106.90
3846	2	23:47:59	14.4112	1575.86	106.91
3848	2	23:49:54	14.4432	1575.85	106.91
3850	2	23:51:49	14.4752	1575.84	106.92
3852	2	23:53:44	14.5072	1575.84	106.92
3854	2	23:55:40	14.5392	1575.83	106.92
3856	2	23:57:35	14.5712	1575.82	106.92
3858	2	23:59:30	14.6032	1575.82	106.91
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3860	3	0: 1:25	14.6352	1575.81	106.91
3862	3	0: 3:20	14.6672	1575.80	106.91
3864	3	0: 5:16	14.6992	1575.80	106.90
3866	3	0: 7:11	14.7312	1575.80	106.91
3868	3	0: 9: 6	14.7632	1575.79	106.91
3870	3	0:11: 1	14.7952	1575.79	106.91
3872	3	0:12:56	14.8272	1575.78	106.92
3874	3	0:14:52	14.8592	1575.77	106.91
3876	3	0:16:47	14.8912	1575.77	106.91
3878	3	0:18:42	14.9232	1575.76	106.90
3880	3	0:20:37	14.9552	1575.76	106.91
3882	3	0:22:32	14.9872	1575.76	106.92
3884	3	0:24:28	15.0192	1575.74	106.91
3886	3	0:26:23	15.0512	1575.74	106.91
3888	3	0:28:18	15.0832	1575.74	106.91
3890	3	0:30:13	15.1152	1575.73	106.91
3892	3	0:32: 8	15.1472	1575.74	106.91
3894	3	0:34: 4	15.1792	1575.73	106.92
3896	3	0:35:59	15.2112	1575.72	106.92
3898	3	0:37:54	15.2432	1575.71	106.91
3900	3	0:39:49	15.2752	1575.70	106.92

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
3902	3	0:41:44	15.3072	1575.70	106.91
3904	3	0:43:40	15.3392	1575.69	106.90
3906	3	0:45:35	15.3712	1575.70	106.90
3908	3	0:47:30	15.4032	1575.69	106.90
3910	3	0:49:25	15.4352	1575.69	106.90
3912	3	0:51:20	15.4672	1575.69	106.90
3914	3	0:53:16	15.4992	1575.68	106.91
3916	3	0:55:11	15.5312	1575.67	106.90
3918	3	0:57: 6	15.5632	1575.67	106.90
3920	3	0:59: 1	15.5952	1575.66	106.90
3922	3	1: 0:56	15.6272	1575.66	106.90
3924	3	1: 2:52	15.6592	1575.65	106.91
3926	3	1: 4:47	15.6912	1575.65	106.90
3928	3	1: 6:42	15.7232	1575.65	106.89
3930	3	1: 8:37	15.7552	1575.64	106.89
3932	3	1:10:32	15.7872	1575.64	106.90
3934	3	1:12:28	15.8192	1575.63	106.90
3936	3	1:14:23	15.8512	1575.63	106.90
3938	3	1:16:18	15.8832	1575.63	106.91
3940	3	1:18:13	15.9152	1575.62	106.91
3942	3	1:20: 8	15.9472	1575.61	106.90
3944	3	1:22: 4	15.9792	1575.62	106.90
3946	3	1:23:59	16.0112	1575.61	106.90
3948	3	1:25:54	16.0432	1575.60	106.90
3950	3	1:27:49	16.0752	1575.59	106.90
3952	3	1:29:44	16.1072	1575.58	106.89
3954	3	1:31:40	16.1392	1575.59	106.89
3956	3	1:33:35	16.1712	1575.58	106.89
3958	3	1:35:30	16.2032	1575.59	106.90
3960	3	1:37:25	16.2352	1575.57	106.89
3962	3	1:39:20	16.2672	1575.56	106.89
3964	3	1:41:16	16.2992	1575.56	106.89
3966	3	1:43:11	16.3312	1575.56	106.89
3968	3	1:45: 6	16.3632	1575.56	106.89
3970	3	1:47: 1	16.3952	1575.56	106.90
3972	3	1:48:56	16.4272	1575.54	106.90
3974	3	1:50:52	16.4592	1575.54	106.89
3976	3	1:52:47	16.4912	1575.53	106.89
3978	3	1:54:42	16.5232	1575.53	106.89
3980	3	1:56:37	16.5552	1575.53	106.89
3982	3	1:58:32	16.5872	1575.52	106.89
3984	3	2: 0:28	16.6192	1575.52	106.89
3986	3	2: 2:23	16.6512	1575.51	106.88
3988	3	2: 4:18	16.6832	1575.51	106.89
3990	3	2: 6:13	16.7152	1575.51	106.89
3992	3	2: 8: 8	16.7472	1575.51	106.90
3994	3	2:10: 4	16.7792	1575.50	106.90
3996	3	2:11:59	16.8112	1575.49	106.90
3998	3	2:13:54	16.8432	1575.48	106.89
4000	3	2:15:49	16.8752	1575.48	106.89
4002	3	2:17:44	16.9072	1575.48	106.89
4004	3	2:19:40	16.9392	1575.47	106.89
4006	3	2:21:35	16.9712	1575.47	106.89
4008	3	2:23:30	17.0032	1575.47	106.90
4010	3	2:25:25	17.0352	1575.46	106.89

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
4012	3	2:27:20	17.0672	1575.45	106.89
4014	3	2:29:16	17.0992	1575.45	106.89
4016	3	2:31:11	17.1312	1575.44	106.88
4018	3	2:33: 6	17.1632	1575.44	106.88
4020	3	2:35: 1	17.1952	1575.44	106.88
4022	3	2:36:56	17.2272	1575.43	106.88
4024	3	2:38:52	17.2592	1575.43	106.87
4026	3	2:40:47	17.2912	1575.42	106.87
4028	3	2:42:42	17.3232	1575.42	106.87
4030	3	2:44:37	17.3552	1575.42	106.87
4032	3	2:46:32	17.3872	1575.41	106.88
4034	3	2:48:28	17.4192	1575.41	106.88
4036	3	2:50:23	17.4512	1575.40	106.88
4038	3	2:52:18	17.4832	1575.40	106.87
4040	3	2:54:13	17.5152	1575.39	106.87
4042	3	2:56: 8	17.5472	1575.38	106.87
4044	3	2:58: 3	17.5792	1575.39	106.87
4046	3	2:59:59	17.6112	1575.38	106.87
4048	3	3: 1:54	17.6432	1575.38	106.88
4050	3	3: 3:49	17.6752	1575.37	106.88
4052	3	3: 5:44	17.7072	1575.37	106.88
4054	3	3: 7:40	17.7392	1575.37	106.87
4056	3	3: 9:35	17.7712	1575.36	106.88
4058	3	3:11:30	17.8032	1575.36	106.88
4060	3	3:13:25	17.8352	1575.34	106.87
4062	3	3:15:20	17.8672	1575.34	106.87
4064	3	3:17:16	17.8992	1575.34	106.86
4066	3	3:19:11	17.9312	1575.34	106.87
4068	3	3:21: 6	17.9632	1575.34	106.87
4070	3	3:23: 1	17.9952	1575.34	106.87
4072	3	3:24:56	18.0272	1575.33	106.88
4074	3	3:26:52	18.0592	1575.33	106.88
4076	3	3:28:47	18.0912	1575.31	106.88
4078	3	3:30:42	18.1232	1575.31	106.88
4080	3	3:32:37	18.1552	1575.32	106.89
4082	3	3:34:32	18.1872	1575.30	106.89
4084	3	3:36:28	18.2192	1575.30	106.88
4086	3	3:38:23	18.2512	1575.29	106.88
4088	3	3:40:18	18.2832	1575.28	106.87
4090	3	3:42:13	18.3152	1575.29	106.87
4092	3	3:44: 8	18.3472	1575.29	106.87
4094	3	3:46: 4	18.3792	1575.28	106.88
4096	3	3:47:59	18.4112	1575.28	106.88
4098	3	3:49:54	18.4432	1575.27	106.88
4100	3	3:51:49	18.4752	1575.26	106.87
4102	3	3:53:44	18.5072	1575.26	106.87
4104	3	3:55:40	18.5392	1575.25	106.86
4106	3	3:57:35	18.5712	1575.26	106.86
4108	3	3:59:30	18.6032	1575.26	106.87
4110	3	4: 1:25	18.6352	1575.25	106.87
4112	3	4: 3:20	18.6672	1575.24	106.87
4114	3	4: 5:15	18.6992	1575.23	106.86
4116	3	4: 7:11	18.7312	1575.23	106.86
4118	3	4: 9: 6	18.7632	1575.23	106.86
4120	3	4:11: 1	18.7952	1575.23	106.86

Company: HOECHST CELANESE CORPORATION
Well: WDW-14 WELL #2
Field: BAY CITY FACILITY, TEXAS

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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
4122	3	4:12:56	18.8272	1575.22	106.86
4124	3	4:14:52	18.8592	1575.22	106.86
4126	3	4:16:47	18.8912	1575.22	106.86
4128	3	4:18:42	18.9232	1575.21	106.86
4130	3	4:20:37	18.9552	1575.20	106.85
4132	3	4:22:32	18.9872	1575.20	106.85
4134	3	4:24:27	19.0192	1575.20	106.86
4136	3	4:26:23	19.0512	1575.20	106.86
4138	3	4:28:18	19.0832	1575.19	106.86
4140	3	4:30:13	19.1152	1575.19	106.86
4142	3	4:32: 8	19.1472	1575.19	106.86
4144	3	4:34: 4	19.1792	1575.18	106.87
4146	3	4:35:59	19.2112	1575.18	106.87
4148	3	4:37:54	19.2432	1575.16	106.86
4150	3	4:39:49	19.2752	1575.17	106.86
4152	3	4:41:44	19.3072	1575.16	106.86
4154	3	4:43:40	19.3392	1575.16	106.86
4156	3	4:45:35	19.3712	1575.16	106.85
4158	3	4:47:30	19.4032	1575.16	106.86
4160	3	4:49:25	19.4352	1575.15	106.85
4162	3	4:51:20	19.4672	1575.15	106.85
4164	3	4:53:16	19.4992	1575.15	106.86
4166	3	4:55:11	19.5312	1575.15	106.87
4168	3	4:57: 6	19.5632	1575.14	106.86
4170	3	4:59: 1	19.5952	1575.13	106.86
4172	3	5: 0:56	19.6272	1575.13	106.86
4174	3	5: 2:52	19.6592	1575.12	106.86
4176	3	5: 4:47	19.6912	1575.12	106.86
4178	3	5: 6:42	19.7232	1575.11	106.86
4180	3	5: 8:37	19.7552	1575.11	106.85
4182	3	5:10:32	19.7872	1575.10	106.85
4184	3	5:12:28	19.8192	1575.10	106.85
4186	3	5:14:23	19.8512	1575.10	106.85
4188	3	5:16:18	19.8832	1575.10	106.85
4190	3	5:18:13	19.9152	1575.09	106.86
4192	3	5:20: 8	19.9472	1575.08	106.85
4194	3	5:22: 4	19.9792	1575.08	106.85
4196	3	5:23:59	20.0112	1575.07	106.84
4198	3	5:25:54	20.0432	1575.07	106.83
4200	3	5:27:49	20.0752	1575.08	106.84
4202	3	5:29:44	20.1072	1575.07	106.84
4204	3	5:31:40	20.1392	1575.07	106.85
4206	3	5:33:35	20.1712	1575.06	106.84
4208	3	5:41:53	20.3096	1575.02	106.84
4210	3	5:43:48	20.3416	1575.04	106.84
4212	3	5:45:43	20.3736	1575.04	106.84
4214	3	5:47:39	20.4056	1575.03	106.84
4216	3	5:49:34	20.4376	1575.03	106.84
4218	3	5:51:29	20.4696	1575.03	106.84
4220	3	5:53:24	20.5016	1575.02	106.84
4222	3	5:55:19	20.5336	1575.01	106.83
4224	3	5:57:15	20.5656	1575.01	106.83
4226	3	5:59:10	20.5976	1575.00	106.83
4228	3	6: 1: 5	20.6296	1575.01	106.83
4230	3	6: 3: 0	20.6616	1575.00	106.83

[ECO SOLUTIONS, INC.]

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

[Saturday: Feb. 19, 1994]
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
4232	3	6: 4:55	20.6936	1575.00	106.84
4234	3	6: 6:51	20.7256	1574.99	106.84
4236	3	6: 8:46	20.7576	1574.99	106.84
4238	3	6:10:41	20.7896	1574.98	106.83
4240	3	6:12:36	20.8216	1574.98	106.84
4242	3	6:14:31	20.8536	1574.98	106.84
4244	3	6:16:27	20.8856	1574.98	106.84
4246	3	6:18:22	20.9176	1574.98	106.84
4248	3	6:20:17	20.9496	1574.97	106.84
4250	3	6:22:12	20.9816	1574.96	106.83
4252	3	6:24: 7	21.0136	1574.97	106.83
4254	3	6:26: 3	21.0456	1574.96	106.84
4256	3	6:27:58	21.0776	1574.96	106.84
4258	3	6:29:53	21.1096	1574.95	106.84
4260	3	6:31:48	21.1416	1574.94	106.84
4262	3	6:33:43	21.1736	1574.95	106.84
4264	3	6:35:39	21.2056	1574.94	106.84
4266	3	6:37:34	21.2376	1574.94	106.83
4268	3	6:39:29	21.2696	1574.94	106.83
4270	3	6:41:24	21.3016	1574.93	106.83
4272	3	6:43:19	21.3336	1574.93	106.83
4274	3	6:45:15	21.3656	1574.93	106.83
4276	3	6:47:10	21.3976	1574.93	106.83
4278	3	6:49: 5	21.4296	1574.92	106.83
4280	3	6:51: 0	21.4616	1574.92	106.83
4282	3	6:52:55	21.4936	1574.91	106.83
4284	3	6:54:51	21.5256	1574.91	106.83
4286	3	6:56:46	21.5576	1574.91	106.83
4288	3	6:58:41	21.5896	1574.90	106.83
4290	3	7: 0:36	21.6216	1574.90	106.83
4292	3	7: 2:31	21.6536	1574.90	106.83
4294	3	7: 4:27	21.6856	1574.89	106.83
4296	3	7: 6:22	21.7176	1574.89	106.83
4298	3	7: 8:17	21.7496	1574.89	106.83
4300	3	7:10:12	21.7816	1574.88	106.83
4302	3	7:12: 7	21.8136	1574.88	106.83
4304	3	7:14: 3	21.8456	1574.87	106.83
4306	3	7:15:58	21.8776	1574.86	106.82
4308	3	7:17:53	21.9096	1574.86	106.82
4310	3	7:19:48	21.9416	1574.86	106.82
4312	3	7:21:43	21.9736	1574.86	106.82
4314	3	7:23:39	22.0056	1574.86	106.82
4316	3	7:25:34	22.0376	1574.86	106.83
4318	3	7:27:29	22.0696	1574.85	106.83
4320	3	7:29:24	22.1016	1574.84	106.83
4322	3	7:31:19	22.1336	1574.84	106.82
4324	3	7:33:15	22.1656	1574.84	106.82
4326	3	7:35:10	22.1976	1574.84	106.83
4328	3	7:37: 5	22.2296	1574.83	106.82
4330	3	7:39: 0	22.2616	1574.83	106.82
4332	3	7:40:55	22.2936	1574.83	106.82
4334	3	7:42:51	22.3256	1574.82	106.82
4336	3	7:44:46	22.3576	1574.81	106.81
4338	3	7:46:41	22.3896	1574.82	106.81
4340	3	7:48:36	22.4216	1574.81	106.81

[ECO SOLUTIONS, INC.]

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

[Saturday: Feb. 19, 1994]
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg. F)
4342	3	7:50:31	22.4536	1574.81	106.81
4344	3	7:52:27	22.4856	1574.80	106.81
4346	3	7:54:22	22.5176	1574.80	106.81
4348	3	7:56:17	22.5496	1574.80	106.81
4350	3	7:58:12	22.5816	1574.80	106.81
4352	3	8: 0: 7	22.6136	1574.79	106.81
4354	3	8: 2: 3	22.6456	1574.79	106.81
4356	3	8: 3:58	22.6776	1574.79	106.81
4358	3	8: 5:53	22.7096	1574.78	106.81
4360	3	8: 7:48	22.7416	1574.78	106.81
4362	3	8: 9:43	22.7736	1574.78	106.80
4364	3	8:11:39	22.8056	1574.78	106.80
4366	3	8:13:34	22.8376	1574.77	106.80
4368	3	8:15:29	22.8696	1574.77	106.81
4370	3	8:17:24	22.9016	1574.77	106.80
4372	3	8:19:19	22.9336	1574.76	106.80
4374	3	8:21:15	22.9656	1574.76	106.80
4376	3	8:23:10	22.9976	1574.76	106.80
4378	3	8:25: 5	23.0296	1574.76	106.80
4380	3	8:27: 0	23.0616	1574.75	106.81
4382	3	8:28:55	23.0936	1574.74	106.80
4384	3	8:30:51	23.1256	1574.74	106.80
4386	3	8:32:46	23.1576	1574.74	106.80
4388	3	8:34:41	23.1896	1574.74	106.80
4390	3	8:36:36	23.2216	1574.73	106.80
4392	3	8:38:31	23.2536	1574.73	106.79
4394	3	8:40:27	23.2856	1574.72	106.79
4396	3	8:42:22	23.3176	1574.72	106.79
4398	3	8:44:17	23.3496	1574.72	106.80
4400	3	8:46:12	23.3816	1574.72	106.79
4402	3	8:48: 7	23.4136	1574.72	106.79
4404	3	8:50: 3	23.4456	1574.71	106.79
4406	3	8:51:58	23.4776	1574.70	106.79
4408	3	8:53:53	23.5096	1574.70	106.79
4410	3	8:55:48	23.5416	1574.70	106.79
4412	3	8:57:43	23.5736	1574.70	106.79
4414	3	8:59:39	23.6056	1574.69	106.79
4416	3	9: 1:34	23.6376	1574.69	106.79
4418	3	9: 3:29	23.6696	1574.69	106.79
4420	3	9: 5:24	23.7016	1574.69	106.79
4422	3	9: 7:19	23.7336	1574.69	106.79
4424	3	9: 9:15	23.7656	1574.68	106.79
4426	3	9:11:10	23.7976	1574.68	106.79
4428	3	9:13: 5	23.8296	1574.68	106.79
4430	3	9:15: 0	23.8616	1574.67	106.79
4432	3	9:16:55	23.8936	1574.67	106.78
4434	3	9:18:51	23.9256	1574.67	106.79
4436	3	9:20:46	23.9576	1574.67	106.79
4438	3	9:22:41	23.9896	1574.66	106.79
4440	3	9:24:36	24.0216	1574.66	106.79
4442	3	9:26:31	24.0536	1574.66	106.79
4444	3	9:28:27	24.0856	1574.65	106.79
4446	3	9:30:22	24.1176	1574.65	106.79
4448	3	9:32:17	24.1496	1574.65	106.79
4450	3	9:34:12	24.1816	1574.64	106.79

Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

[Saturday: Feb. 19, 1994]
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
4452	3	9:36: 7	24.2136	1574.64	106.79
4454	3	9:38: 3	24.2456	1574.64	106.78
4456	3	9:39:58	24.2776	1574.63	106.78
4458	3	9:41:53	24.3096	1574.63	106.78
4460	3	9:43:48	24.3416	1574.63	106.78
4462	3	9:45:43	24.3736	1574.63	106.79
		Go down and tag bottom, then pull out of hole making static gradient stops.			
4463	3	9:46:41	24.3896	1574.62	106.79
4466	3	9:49:34	24.4376	1574.29	106.79
4468	3	9:51:29	24.4696	1564.17	107.30
4470	3	9:53:24	24.5016	1568.89	107.13
4472	3	9:55:19	24.5336	1479.10	107.00
4474	3	9:57:15	24.5656	1401.19	107.35
4476	3	9:59:10	24.5976	1400.18	107.10
4478	3	10: 1: 5	24.6296	1383.88	106.98
4480	3	10: 3: 0	24.6616	1383.94	106.96
4482	3	10: 4:55	24.6936	1383.95	106.96
4484	3	10: 6:51	24.7256	1383.95	106.96
4486	3	10: 8:46	24.7576	1383.95	106.96
4488	3	10:10:41	24.7896	1383.95	106.96
		Depart 3,000 feet.			
		Go back down hole to adjust line on spool.			
4489	3	10:11:39	24.8056	1383.95	106.96
4492	3	10:14:31	24.8536	1285.23	106.65
4494	3	10:16:27	24.8856	1145.61	105.36
4496	3	10:18:22	24.9176	1003.47	104.04
4498	3	10:20:17	24.9496	949.84	102.96
4500	3	10:22:12	24.9816	950.32	102.83
4502	3	10:24: 7	25.0136	950.41	102.79
4504	3	10:26: 3	25.0456	950.44	102.76
4506	3	10:27:58	25.0776	950.45	102.74
4508	3	10:29:53	25.1096	950.44	102.72
		Depart 2,000 feet.			
4509	3	10:30:51	25.1256	950.45	102.72
4512	3	10:33:43	25.1736	821.88	101.72
4514	3	10:35:39	25.2056	704.03	100.68
4516	3	10:37:34	25.2376	574.98	99.65
4518	3	10:39:29	25.2696	515.46	98.48
4520	3	10:41:24	25.3016	515.82	98.44
4522	3	10:43:19	25.3336	515.90	98.42
4524	3	10:45:15	25.3656	515.91	98.40
4526	3	10:47:10	25.3976	515.91	98.40
		Depart 1,000 feet.			
4527	3	10:48: 7	25.4136	515.91	98.39
4530	3	10:51: 0	25.4616	364.07	97.84
4532	3	10:52:55	25.4936	298.13	96.93
4534	3	10:54:51	25.5256	298.32	96.90
4536	3	10:56:46	25.5576	298.38	96.88
4538	3	10:58:41	25.5896	298.40	96.87
4540	3	11: 0:36	25.6216	298.40	96.86
		Depart 500 feet.			
4541	3	11: 1:34	25.6376	298.40	96.84
4544	3	11: 4:27	25.6856	221.55	96.98
4546	3	11: 6:22	25.7176	155.00	96.24

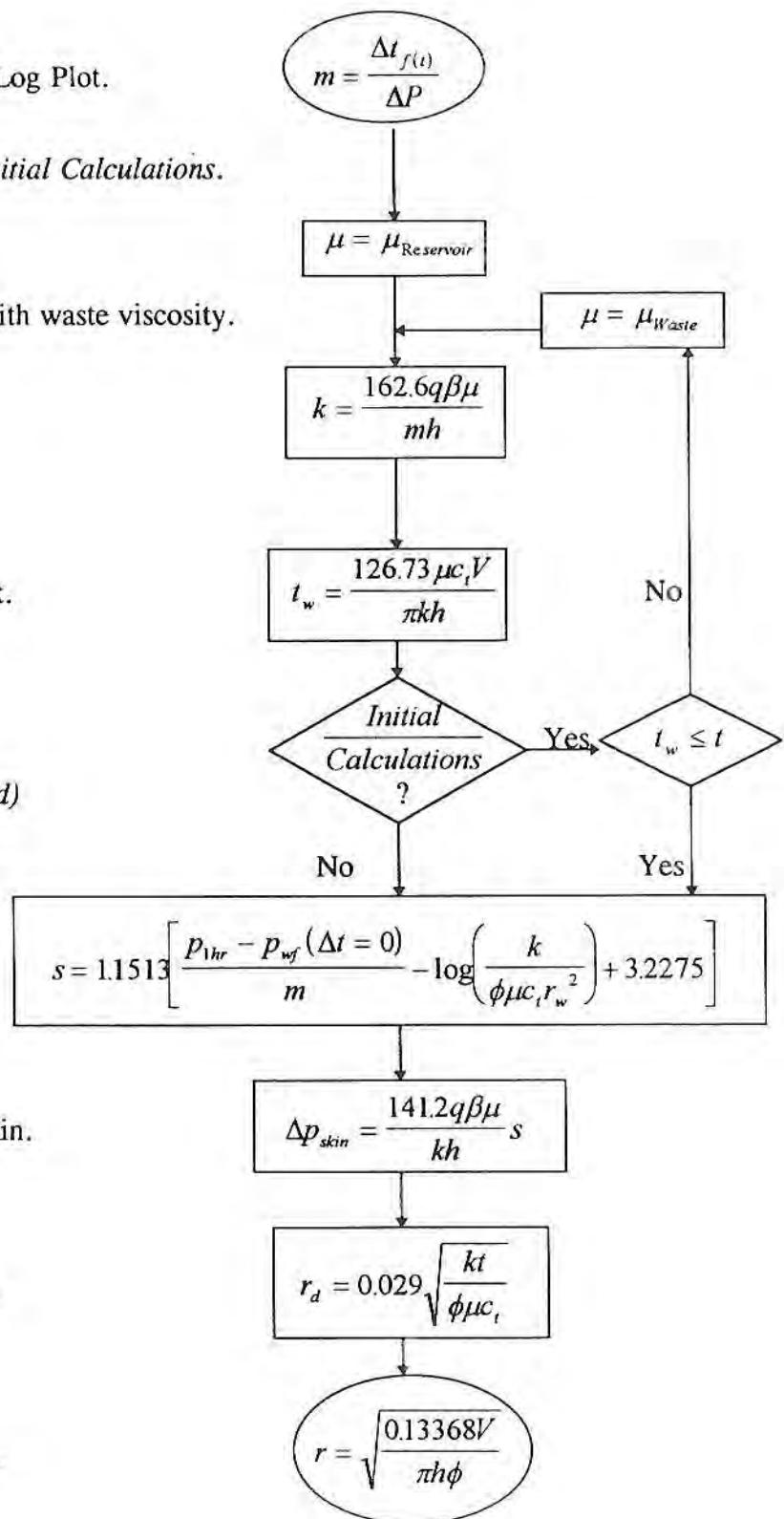
**ECO Solutions, Inc.
Hoechst Celanese Chemical Group, Inc.
Pressure Falloff/MIT Testing**

APPENDIX C

CALCULATION FLOW CHART

CALCULATION FLOW CHART

1. Calculate slope value from Semi-Log Plot.
- 2 a. Utilize reservoir viscosity for *Initial Calculations*.
- 2 b. If required, redo calculations with waste viscosity.
3. Calculate Permeability.
4. Calculate Time to exit waste front.
5. Conditional statements.
(t, beginning of radial flow period)
6. Calculate skin factor.
7. Calculate Pressure drop due to skin.
8. Calculate radius of investigation.
9. Calculate distance to waste front.



**ECO Solutions, Inc.
Hoechst Celanese Chemical Group, Inc.
Pressure Falloff/MIT Testing**

APPENDIX D

GAUGE CALIBRATION CERTIFICATE

GAUGE S/N: 69491
RANGE: 5,000
DATE CALIBRATED: 1-19-94

*** TEMPERATURE SUMMARY ***

MAXIMUM POSITIVE ERROR:	1.366 Deg F
MAXIMUM NEGATIVE ERROR:	-0.811 Deg F
MAXIMUM ERROR SPECIFICATION:	3.000 Deg F
NUMBER OF POINTS EXCEEDING ERROR SPEC:	0
SENSITIVITY:	0.078 Deg F/Hz
SENSITIVITY:	12.804 Hz/Deg F

*** PRESSURE SUMMARY ***

MAXIMUM POSITIVE ERROR:	1.300 PSIA
OCCURS AT:	251.366 Deg F
AND AT:	4016.000 PSIA
MAXIMUM NEGATIVE ERROR:	-1.670 PSIA
OCCURS AT:	149.609 Deg F
AND AT:	3013.030 PSIA
MAXIMUM ERROR SPECIFICATION:	20.000 PSIA
NUMBER OF POINTS EXCEEDING SPEC:	0
PERCENTAGE OF POINTS EXCEEDING SPECS:	0.000 %

SENSITIVITY:	2.772 PSIA/Hz
SENSITIVITY:	0.361 Hz/PSIA



MILTON M. COOKE COMPANY

WELL TESTING SPECIALISTS

2310 McALLISTER

713/683-0333

HOUSTON, TEXAS 77092

TX. WATS: 1-800-392-3861

FAX: 683-0128

FIELD CALIBRATION CHECK: [PRE-TEST]

(GRC EPG-520 - SURFACE READOUT GAUGE)

DATE: 02/16/1994

D.W.T. S/N: 13469

GRC GAUGE S/N: 69491

D.W.P. (PSIG)	GAUGE PRESSURE (PSIA)	DIFFERENCE (+/-PSI)
<u>550.0</u>	<u>562.78</u>	<u>+12.78</u>
<u>1550.0</u>	<u>1558.52</u>	<u>+8.52</u>
<u>2050.0</u>	<u>2056.36</u>	<u>+6.36</u>
<u>0.0</u>	<u>13.79</u>	<u>+13.79</u>



MILTON M. COOKE COMPANY

WELL TESTING SPECIALISTS

2310 McALLISTER
713/683-0333

HOUSTON, TEXAS 77092
TX. WATS: 1-800-392-3861
FAX: 683-0128

FIELD CALIBRATION CHECK: [POST-TEST]

(GRC EPG-520 - SURFACE READOUT GAUGE)

DATE: 02/19/1994

D.W.T. S/N: 13469

GRC GAUGE S/N: 69491

D.W.P. (PSIG)	GAUGE PRESSURE (PSIA)	DIFFERENCE (+/-PSI)
<u>0.0</u>	<u>13.08</u>	<u>+13.08</u>
<u>550.0</u>	<u>560.13</u>	<u>+10.13</u>
<u>1050.0</u>	<u>1058.36</u>	<u>+8.36</u>
<u>2050.0</u>	<u>2061.99</u>	<u>+11.99</u>

**ECO Solutions, Inc.
Hoechst Celanese Chemical Group, Inc.
Pressure Falloff/MIT Testing**

APPENDIX E

STATIC GRADIENT SURVEY

Company: HOECHST CELANESE CORPORATION
Well: WDW-14 WELL #2
Field: BAY CITY PLANT

County: MATAGORDA
State: TEXAS

Engineer: DOUG BEALL
Gauge Type: GRC EPG-520
Serial No.: 69491
Gauge Range: 5,000, PSI
Gauge Depth: 3440 ft

Date: 02/19/1994
Well Type: INJECTION
Test Type: GRADIENT SURVEY
Well Status: SHUT-IN

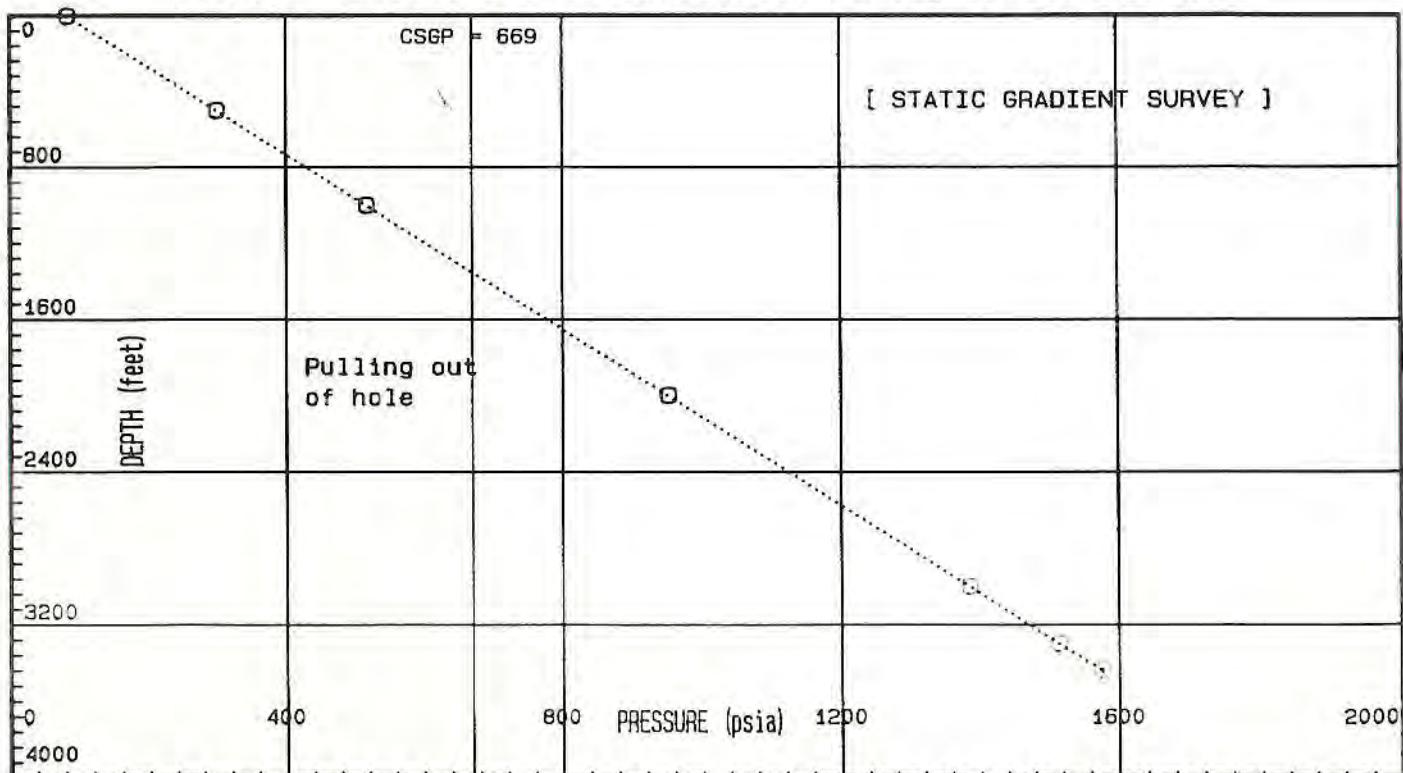
Tubing: 5 1/2" TO 3162' Packer Depth 3162 ft
Tubing: TO PBTD 3780 ft
Casing: 9 5/8" TO 3750' Oil Level None
Perfs.: 3354' - 3414' 3450' - 3520' H2O Level None
Perfs.: 3520' - 3550'
Elevation: 11 Zero: KB
Shut-in Time 24 hrs Prod. Time 2721 hrs

Shut-in BHP 1575 @ 3440 ft Shut-in BHT 107 F @ 3440 ft
Flowing BHP 1790 @ 3440 ft Flowing BHT 106 F @ 3440 ft
Shut-in WHP 83 Shut-in WHT 85 F
Flowing WHP 493 Flowing WHT 84 F Casing 669

[GRADIENT DATA]

#	MD	TVD	PRESSURE	PSI/ft
1	0	0	83.36	
2	500	500	298.40	0.430
3	1000	1000	515.91	0.435
4	2000	2000	950.45	0.435
5	3000	3000	1383.95	0.433
6	3300	3300	1514.00	0.433
7	3440	3440	1574.62	0.433

Remarks: Fill @ 3440 ft. - Fluid level at wellhead.
Pressure @ 3300 ft. is calculated at top of formation.



Company: HOECHST CELANESE CORPORATION
 Well: WDW-14 WELL #2
 Field: BAY CITY FACILITY, TEXAS

[Saturday: Feb. 19, 1994]
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REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
4452	3	9:36: 7	24.2136	1574.64	106.79
4454	3	9:38: 3	24.2456	1574.64	106.78
4456	3	9:39:58	24.2776	1574.63	106.78
4458	3	9:41:53	24.3096	1574.63	106.78
4460	3	9:43:48	24.3416	1574.63	106.78
4462	3	9:45:43	24.3736	1574.63	106.79
		Go down and tag bottom, then pull out of hole making static gradient stops.			
4463	3	9:46:41	24.3896	1574.62	106.79
4466	3	9:49:34	24.4376	1574.29	106.79
4468	3	9:51:29	24.4696	1564.17	107.30
4470	3	9:53:24	24.5016	1568.89	107.13
4472	3	9:55:19	24.5336	1479.10	107.00
4474	3	9:57:15	24.5656	1401.19	107.35
4476	3	9:59:10	24.5976	1400.18	107.10
4478	3	10: 1: 5	24.6296	1383.88	106.98
4480	3	10: 3: 0	24.6616	1383.94	106.96
4482	3	10: 4:55	24.6936	1383.95	106.96
4484	3	10: 6:51	24.7256	1383.95	106.96
4486	3	10: 8:46	24.7576	1383.95	106.96
4488	3	10:10:41	24.7896	1383.95	106.96
		Depart 3,000 feet.			
		Go back down hole to adjust line on spool.			
4489	3	10:11:39	24.8056	1383.95	106.96
4492	3	10:14:31	24.8536	1285.23	106.65
4494	3	10:16:27	24.8856	1145.61	105.36
4496	3	10:18:22	24.9176	1003.47	104.04
4498	3	10:20:17	24.9496	949.84	102.96
4500	3	10:22:12	24.9816	950.32	102.83
4502	3	10:24: 7	25.0136	950.41	102.79
4504	3	10:26: 3	25.0456	950.44	102.76
4506	3	10:27:58	25.0776	950.45	102.74
4508	3	10:29:53	25.1096	950.44	102.72
		Depart 2,000 feet.			
4509	3	10:30:51	25.1256	950.45	102.72
4512	3	10:33:43	25.1736	821.88	101.72
4514	3	10:35:39	25.2056	704.03	100.68
4516	3	10:37:34	25.2376	574.98	99.65
4518	3	10:39:29	25.2696	515.46	98.48
4520	3	10:41:24	25.3016	515.82	98.44
4522	3	10:43:19	25.3336	515.90	98.42
4524	3	10:45:15	25.3656	515.91	98.40
4526	3	10:47:10	25.3976	515.91	98.40
		Depart 1,000 feet.			
4527	3	10:48: 7	25.4136	515.91	98.39
4530	3	10:51: 0	25.4616	364.07	97.84
4532	3	10:52:55	25.4936	298.13	96.93
4534	3	10:54:51	25.5256	298.32	96.90
4536	3	10:56:46	25.5576	298.38	96.88
4538	3	10:58:41	25.5896	298.40	96.87
4540	3	11: 0:36	25.6216	298.40	96.86
		Depart 500 feet.			
4541	3	11: 1:34	25.6376	298.40	96.84
4544	3	11: 4:27	25.6856	221.55	96.98
4546	3	11: 6:22	25.7176	155.00	96.24

[ECO SOLUTIONS, INC.]

Company: HOECHST CELANESE CORPORATION
Well: WDW-14 WELL #2
Field: BAY CITY FACILITY, TEXAS

[Saturday: Feb. 19, 1994]
Page 33

REC #	DAY	REAL TIME	DT (HRS)	BHP (PSIA)	BHT (Deg.F)
4548	3	11: 8:17	25.7496	104.06	95.10
		Arrived at surface.			
4549	3	11: 9:15	25.7656	91.84	93.30
4552	3	11:12: 7	25.8136	81.51	86.53
4554	3	11:14: 3	25.8456	82.64	86.12
4556	3	11:15:58	25.8776	83.12	85.87
4558	3	11:17:53	25.9096	83.31	85.65
4560	3	11:19:48	25.9416	83.38	85.48
4562	3	11:21:43	25.9736	83.36	85.30
4564	3	11:23:39	26.0056	83.37	85.12
4566	3	11:25:34	26.0376	83.36	84.96
4568	3	11:27:29	26.0696	83.36	84.79
4570	3	11:29:24	26.1016	83.36	84.65
		Shut in master valve and bleed off lubricator.			
4571	3	11:30:22	26.1176	83.54	84.58
4574	3	11:33:15	26.1656	58.34	84.45

[ECO SOLUTIONS, INC.]

**ECO Solutions, Inc.
Hoechst Celanese Chemical Group, Inc.
Pressure Falloff/MIT Testing**

APPENDIX F

RADIOACTIVE TRACER SURVEY AND ATLAS WIRELINE SERVICES INTERPRETATION LETTER

DIAGNOSTIC RADIOACTIVE TRACERLOG

**Hoechst Celanese Corporation
Well No. 2 - WDW #14
Bay City Plant
Matagorda County, Texas**

**Prepared for
ECO Solutions, Inc.
Houston, Texas**

**ATLAS WIRELINE SERVICES
WESTERN ATLAS INTERNATIONAL**

February 22, 1994

Prepared by Freeman Hill, III

DISCLAIMER

In making interpretations of logs, our employees will give Customer the benefit of their best judgement, but since all interpretations are opinions based on inferences from electrical or other measurements, we cannot, and we do not guarantee the accuracy or the correctness of any interpretation. We shall not be liable or responsible for any loss, cost, damages, or expenses whatsoever incurred or sustained by the Customer resulting from any interpretation made/by any of our employees.



ATLAS WIRELINE SERVICES

Disposal Well Background

The Hoechst Celanese Chemical Company , Inc.'s Injection Well No. 2 - WDW #14, located at the Bay City facility has been used for underground injection for the past 26 years. In addition to surface and intermediate casing strings, the well contains a string of 9 5/8 inch OD casing cemented to 3650 ft and 5.5 inch tubing and packer assembly, located at 3165 ft. Disposed fluids have been injected into a perforated interval located below 3354 ft at rates of approximately 185 - 190 GPM.

A logging program consisting of a Radioactive Tracer ejector and detector instrument and a Differential Temperature Tool was used to evaluate the integrity of the casing and cement and to verify that the injection interval had accepted the disposed fluids.

Radioactive Tracerlog Survey

1. Logged gamma ray from well depth of 2888 ft to 3350 ft. (Could not log deeper due to length of tool and an obstruction in wellbore.)

Purpose: Base-line for radioactive tracer instrument and post survey.

Analysis: Gamma ray instruments respond to naturally occurring radiation (e.g., potassium, uranium, thorium) found in formations. Normally, shaly formations tend to contain more of these gamma ray-producing elements than a sand formation.

2. While injecting into the well at 20 gpm, radioactive material (Iodine -131) was ejected from radioactive tracer instrument at 2900 ft. The instrument was lowered further into the well and then logged in the upward direction in order to intercept and detect the radioactive slug as it moved down the well. By repeating this process of lowering the instrument and logging in the upward direction, the radioactive slug was traced through the casing packer and into the injection interval located below.

Purpose: Ensure injected fluids move through the tubing in a downward direction and that no upward or out of zone fluid movement through a cement channel is detected.

Analysis: The following table depicts the depths where the detector intercepted the radioactive slug as it moved with the surface-injected fluids downward toward the injection interval.

Logging Program and Analysis (Cont.)
Hoecsh Celanese Chemical Corporation, Inc. Well No. 2
Page 2

File	Interception	
#	Depth ft. (Bottom Detector)	
17	2962	
18	3080	
19	3168 - 3180	Split
20	3168 - 3214	
21	3168 - 3248	
22	3282	Did not log
23	3310	above 3200 ft.
24	3344	
25	3347	Tail End
26	----	Gone
27	3168	Stray still there.

The radioactive peak responses from the first pass, file # 17, to file # 27 the last pass, become smaller, but cover a longer vertical interval, due to the movement of the wireline and instrument mixing the radioactive slug with the injected fluids. At file #19 the radioactive slug appears to split at 3168 ft. The information after this suggests that the radioactive material is leaving the borehole at 3168 ft. The rest of the radioactive material appears to continually move in the downward direction and into the disposal interval.

3. Repeat step 2 (Chase Survey). (Pump Rate = 20 GPM)

Purpose: Ensure injected fluids move through the tubing in a downward direction and that no channel activity (fluid movement) to other zones above the target interval is detected.

Analysis: The following table depicts the depths where the detector intercepted the second radioactive slug (ejected at 2900 ft) as it moved with the injected fluids downward toward the injection interval.

Logging Program and Analysis (Cont.)
Hoechst Celanese Chemical Corporation, Inc. Well No. 2
Page 3

File #	Interception Depth ft.	(Bottom Detector)
28	2971	
29	3120	
30	3167 - 3212	Split
31	3260	Not logged above
32	3300	3200 ft.
33	3338	
34	3346	Tail End
35	----	Gone
36	3168	Stray still there.

Again, the radioactive peak responses on the log become smaller (and wider) during the survey due to the mixing action of the wireline and instrument. At file # 30 the radioactive slug again appears to split. This would indicate a possible hole at 3168 ft. The rest of the radioactive slug appeared to continuously move down to the disposal area.

4. The tool was stationed at 3342 ft, directly above the perforated interval, for a stationary reading. The radioactive isotope is released and after the initial response to the isotope passing by the detector in a downward motion, then the isotope or an increase in radiation, should not be monitored again. If the isotope is seen again, then communication (channel behind pipe) is highly possible.

Purpose: Ensure injected fluids move downward and not back up on the outside of casing in a channel, (Pump Rate - 50 GPM) (30-minute test).

Analysis: After the initial response to the radioactive slug, the isotope did not come back into the tools' vicinity. No channel indicated.

5. Repeat step 4 (Stationary Reading). (Pump Rate - 50 GPM) (30-minute test).

Purpose: Ensure injected fluids are not channeling up.

Analysis: After the initial response to the radioactive slug, the isotope did not come back in the tools' vicinity. No channel indicated.



**ATLAS
WIRELINE
SERVICES**

NUCLEAR TRACER LOG

FILE NO.

94061

API NO.

WELL

NO. 2 WELL - WDW 14

FIELD

CELANESE PLANT

COUNTY

MATAGORDA

STATE

TX.

LOCATION:
BAY CITY PLANT

OTHER SERVICES
TEMP/GR

IN MAKING INTERPRETATIONS OF LOGS OUR
EMPLOYEES WILL GIVE CUSTOMER THE BENE-
FIT OF THEIR BEST JUDGEMENT, BUT SINCE
ALL INTERPRETATIONS ARE OPTIONS BASED
ON INFERENCES FROM ELECTRICAL OR OTHER
MEASUREMENTS, WE CANNOT, AND WE DO NOT
GUARANTEE THE ACCURACY OR CORRECTNESS
OF ANY INTERPRETATION. WE SHALL NOT BE
LIBLE OR RESPONSIBLE FOR ANY LOSS,
COST, DAMAGES, OR EXPENSES WHATSOEVER
INCURRED OR SUSTAINED BY THE CUSTOMER
RESULTING FROM ANY INTERPRETATION MADE
BY ANY OF OUR EMPLOYEES.

FINAL PRINT

PERMENENT DATUM	Q.	ELEV.	N/A	ELEVATIONS
LOGGING MEASURED FROM	KB	FT.	ABOVE P.D.	KB OF GL
DRILLING MEASURED FROM	KB			N/A
DATE	2/22/94			
RUN	1			
SERVICE ORDER	143815			
DEPTH-DRILLER	3650			
DEPTH-LOGGER	3443			
BOTTOM LOGGED INTERVAL	3350			
TOP LOGGED INTERVAL	2800			
TYPE FLUID IN HOLE	BRINE			
SALINITY PPM Q.	N/A			
DENSITY LB/GAL.	N/A			
LEVEL	FULL			
MAX. REC. TEMP. DEG. F	101			
OVR. RIG TIME	CRANE			
EQUIP. NO. / LOC.	6428	HOUSTON		
RECORDED BY	FERGUSON			
WITNESSED BY	MR. HALL			
BOREHOLE RECORD				

FOLD HERE

REMARKS RUN (1)

TOOL CONFIGURATION WAS ONE DETECTOR ABOVE AND BELOW INJECTOR.
PUMP-IN RATE OF 0 GPM. ESTABLISHED FOR CHASE DOWN RUNS.
PUMP-IN RATE OF 0 GPM. ESTABLISHED FOR STATIONARY READINGS.
WELL SHUT-IN 48 HRS. PRIOR TO LOGGING TEMPERATURE RUN (2/21/94).

BASE LOG PASSES BEFORE LOG

FILE: 16

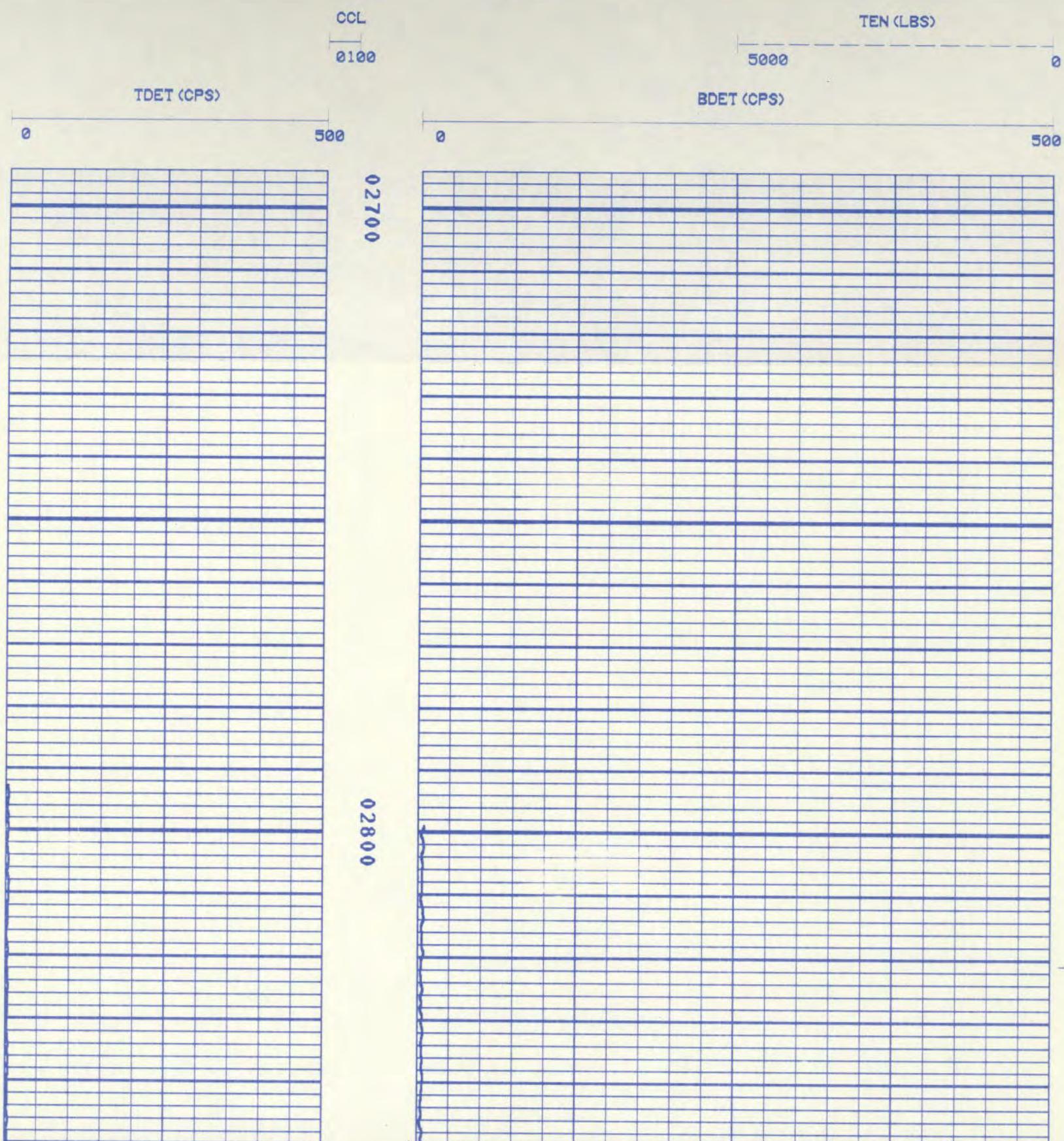
CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
-------	-------------	-------

DISPLAY SCALE CHANGES

*** NONE ***

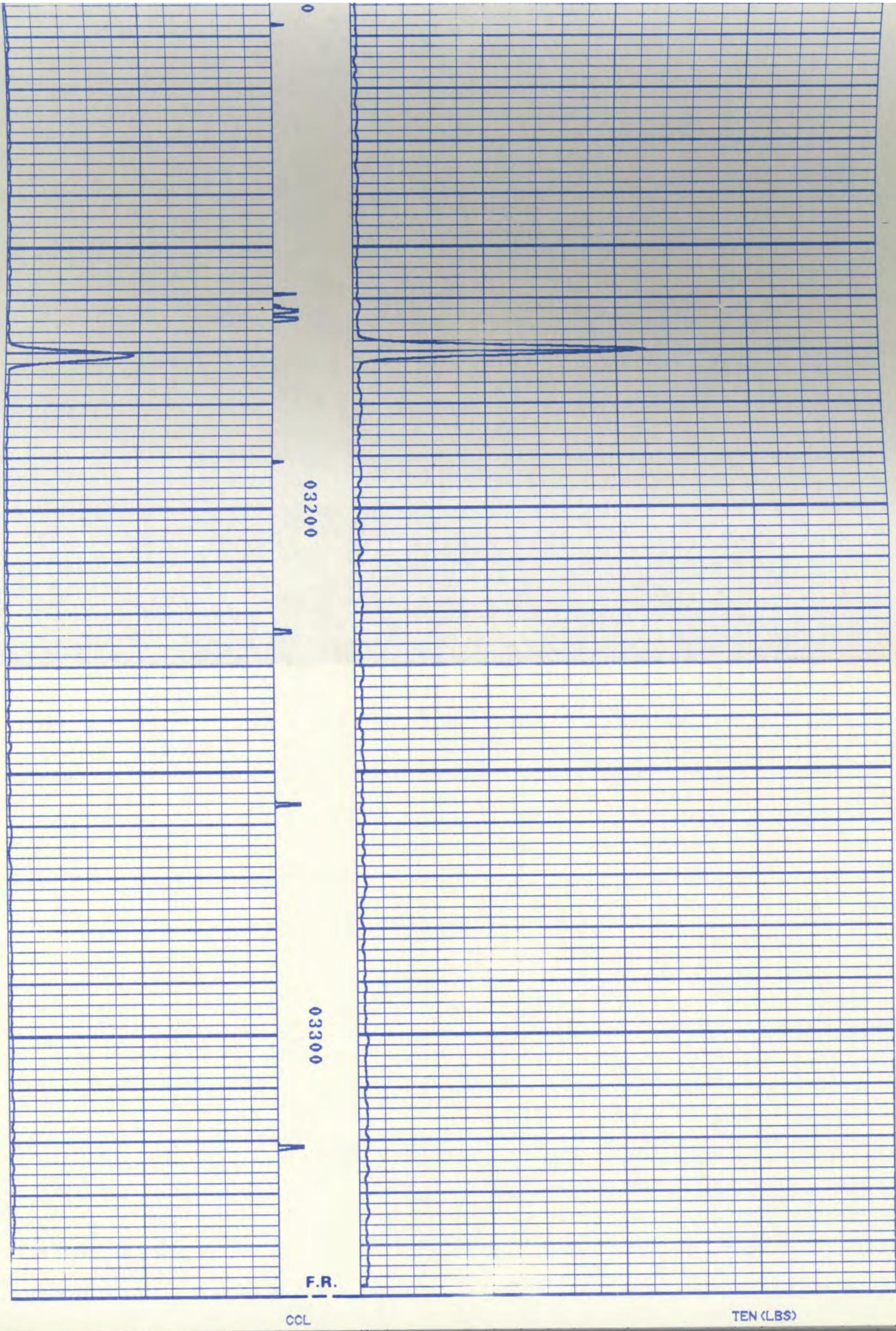
COMPANY: CELANESE CHEMICAL COMPANY INC. RUN: 1
WELL NAME: NO. 2 WELL - WDW 14 TRIP: 1
SERVICE: F 150A FILE: 16 DATE: 02/22/94 TIME: 17:39:53
REVISION: FSYS256 REV:G002 VER:2.0 MODE: RECORD



02900

03000

0310



0100

5000

0

TDET (CPS)

0

500

0

500

BDET (CPS)

FILE: 16

FILE: 15

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
TDET	6,6	FT,IN
BDET	0	FT,IN
CCL	16,0	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

SERVICE: F 150A FILE: 15

DATE: 02/22/94

TIME: 17:22:10

REVISION: FSYS256 REV:Q002 VER:2.0

MODE: RECORD

CCL
0100

TEN (LBS)

REPEAT SECTION

5000

0

TDET (CPS)

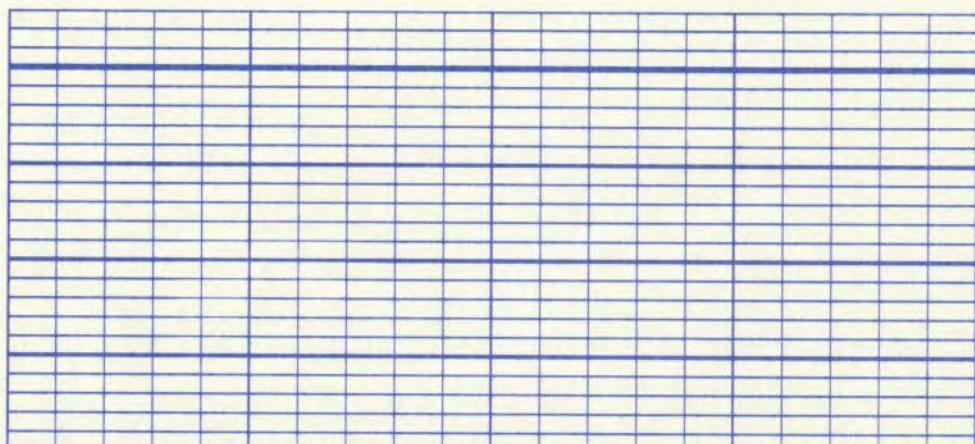
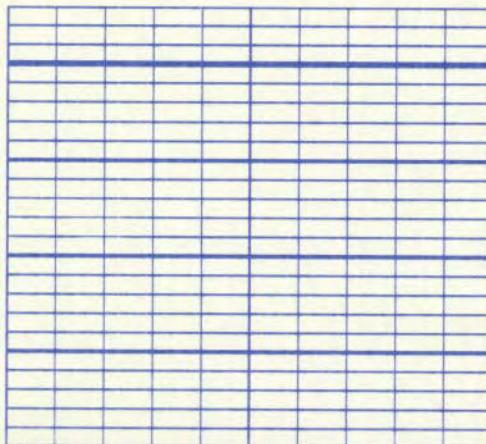
0

500

0

500

02700



02800

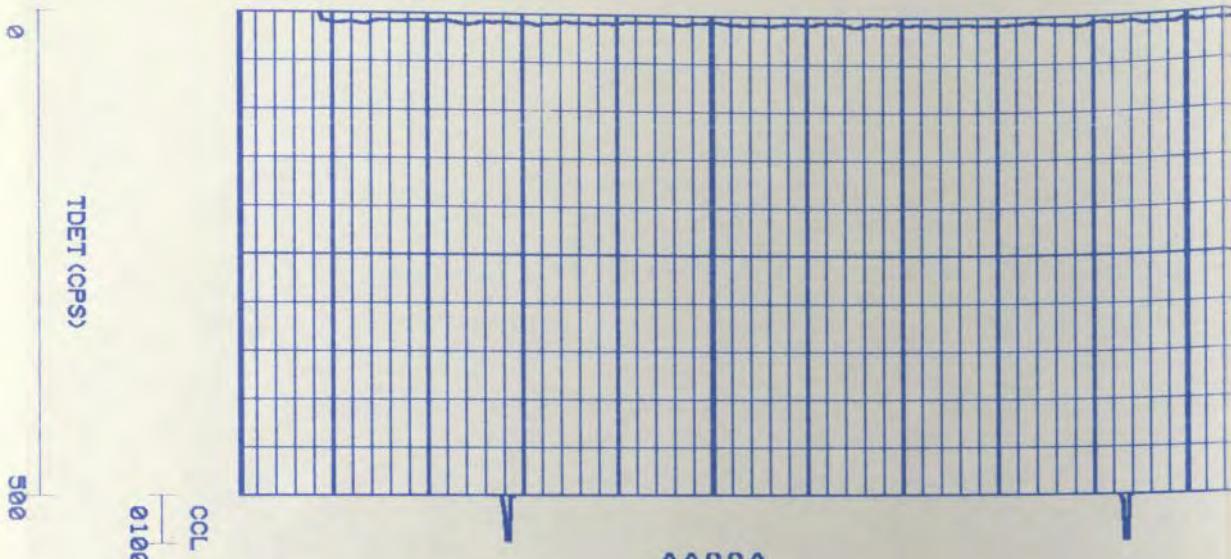
02900

03000

03100

03200

03300



FILE: 15

FILE: 27

CCL
0100

TDET (CPS)

0
500

5000

TEN (LBS)

BDET (CPS)

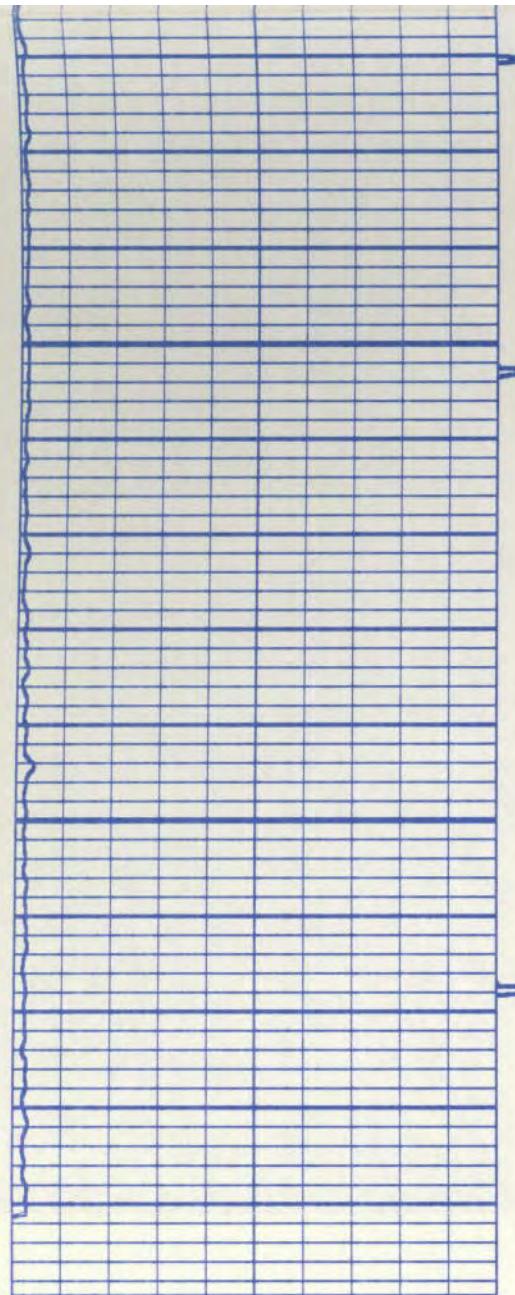
0
500

03000

03100

CHASE-DOWN NO. 1 WITH PUMP IN RATE OF 20 GPM.

FILES 17-27

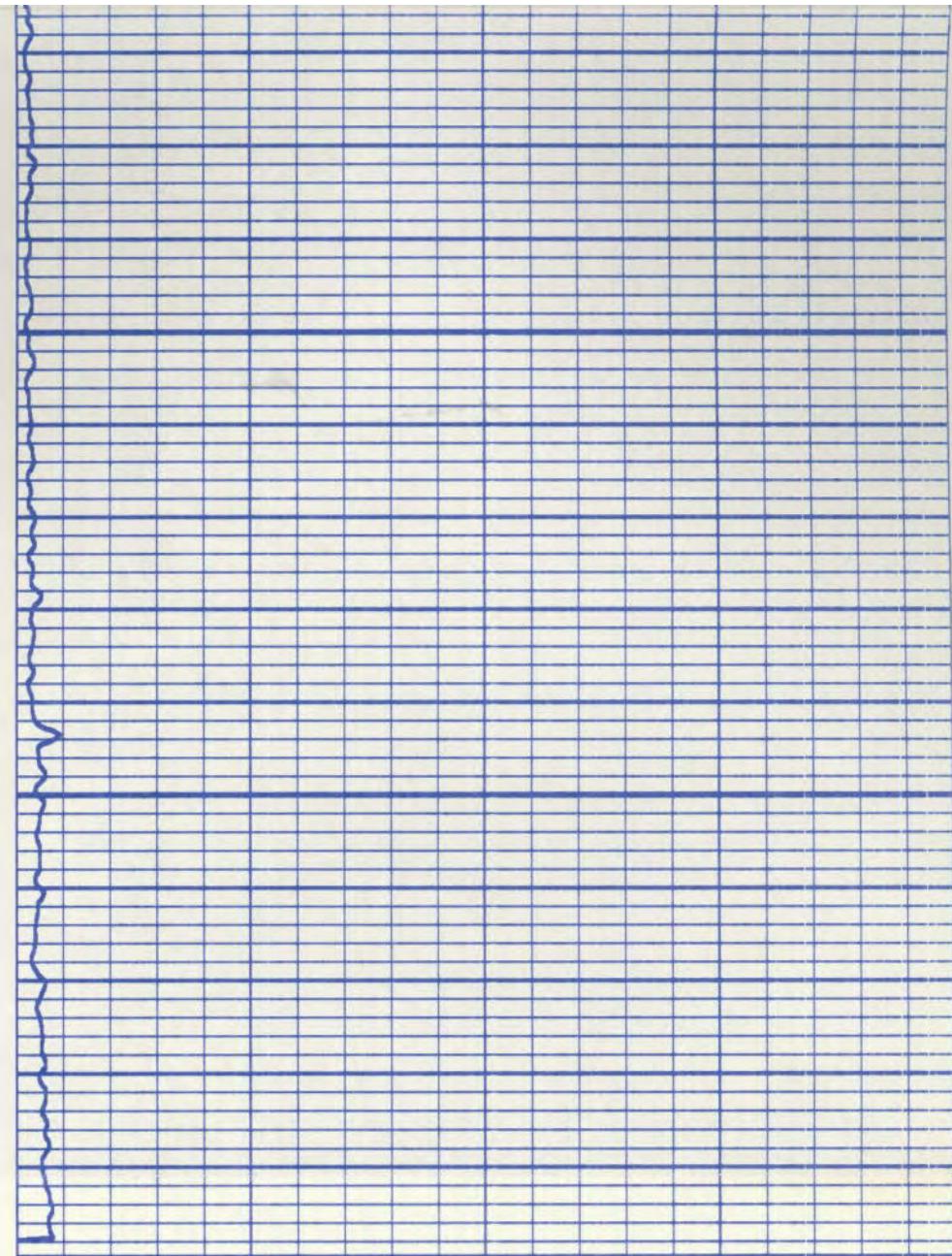


03300

CCL
0100

TDET (CPS)

0 500



TEN (LBS)

5000

0

BDET (CPS)

0 500

FILE: 27

FILE: 26

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

SERVICE: F 150A FILE: 26

DATE: 02/22/94

TIME: 18:46:09

REVISION: FSYS256 REV:Q002 VER:2.0

MODE: PLAYBACK

CCL
0100

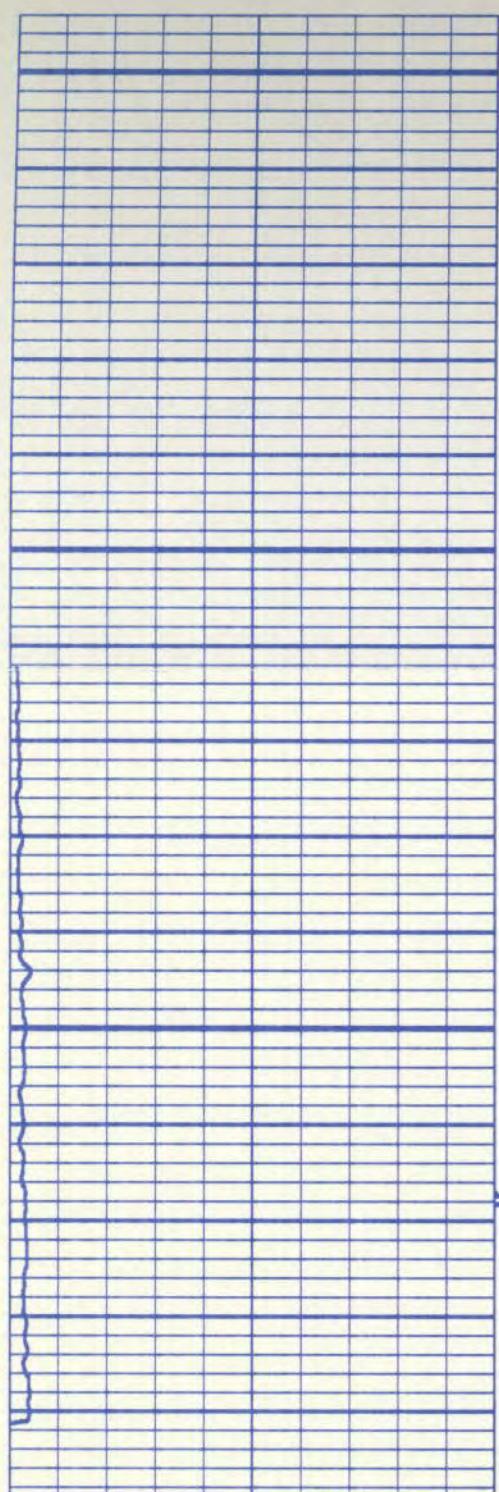
TEN (LBS)

5000

0

TDET (CPS)

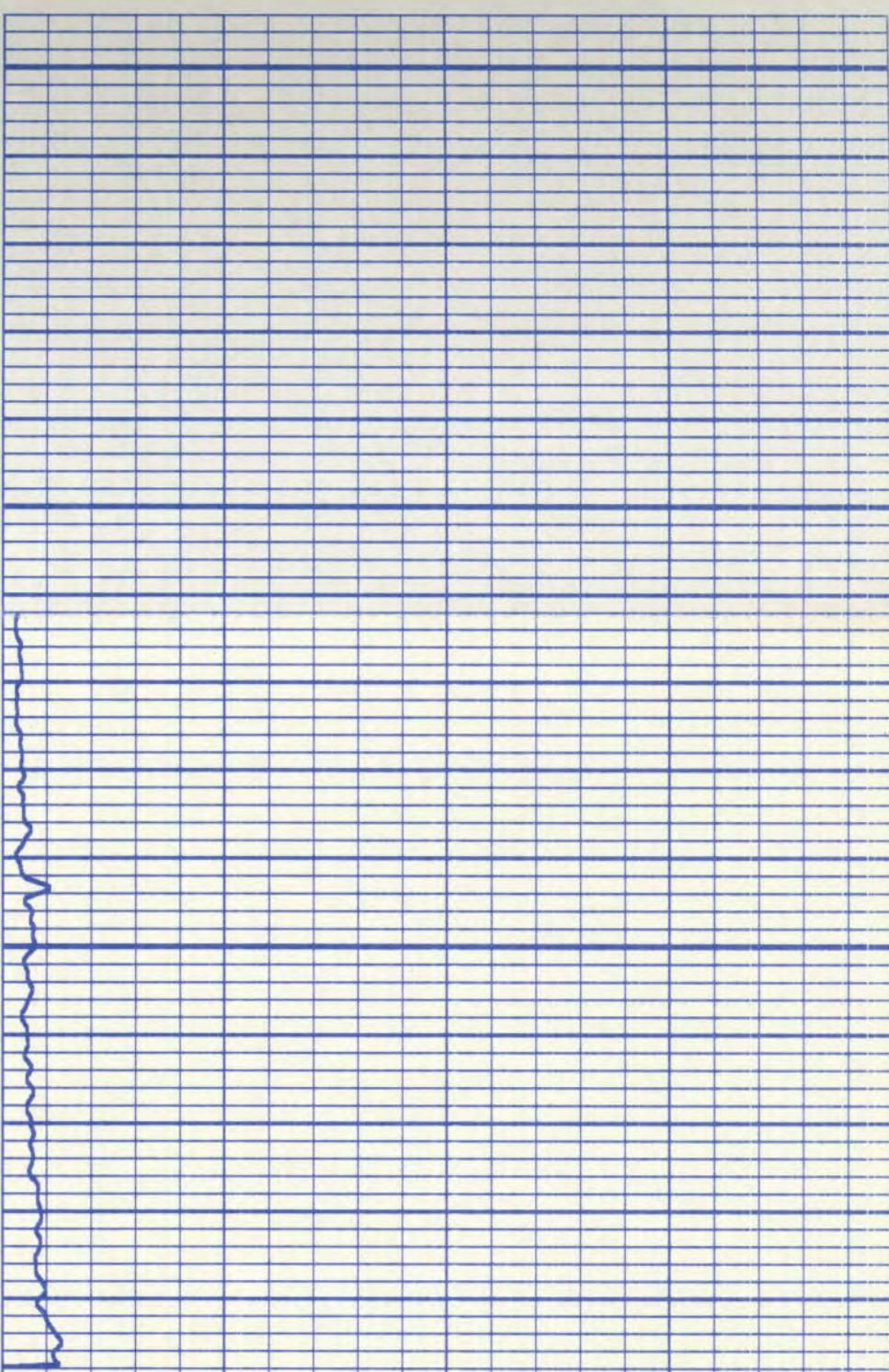
0 500



03200

BDET (CPS)

0 500



CCL
0100

TEN (LBS)

5000

0

TDET (CPS)

0 500

500

0

BDET (CPS)

500

FILE: 26

FILE: 25

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

WELL NAME: NO. 2 WELL - WDW 14

RUN: 1
TRIP: 1

SERVICE: F 150A FILE: 25 DATE: 02/22/94 TIME: 18:43:38

REVISION: FSYS256 REV:G002 UER:2.0 MODE: PLAYBACK

TEN (LBS)

CCL
0100

5000

TDET (CPS)

500

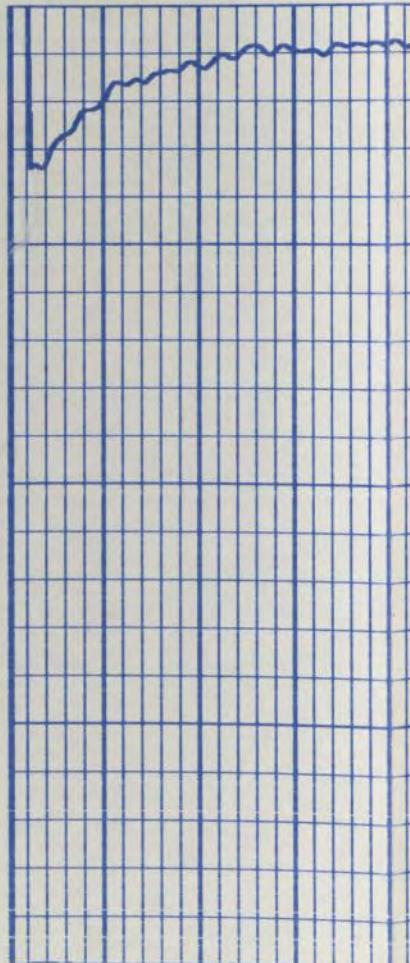
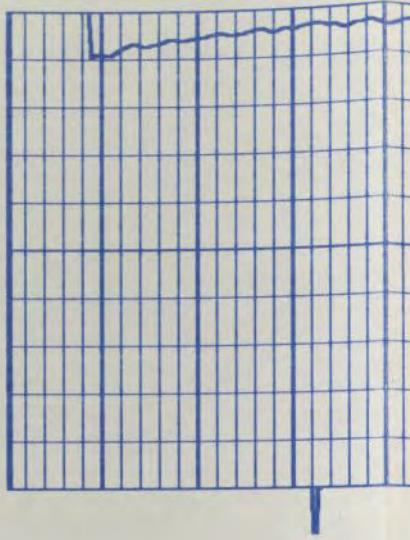
0

BDET (CPS)

500

0

03200



ccl

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TDET (CPS)

800

8

FILE: 25

卷之三

FILE: 24

PARAMETERS

米来米 ZONE 米来米

DISPLAY SCALE CHANGES

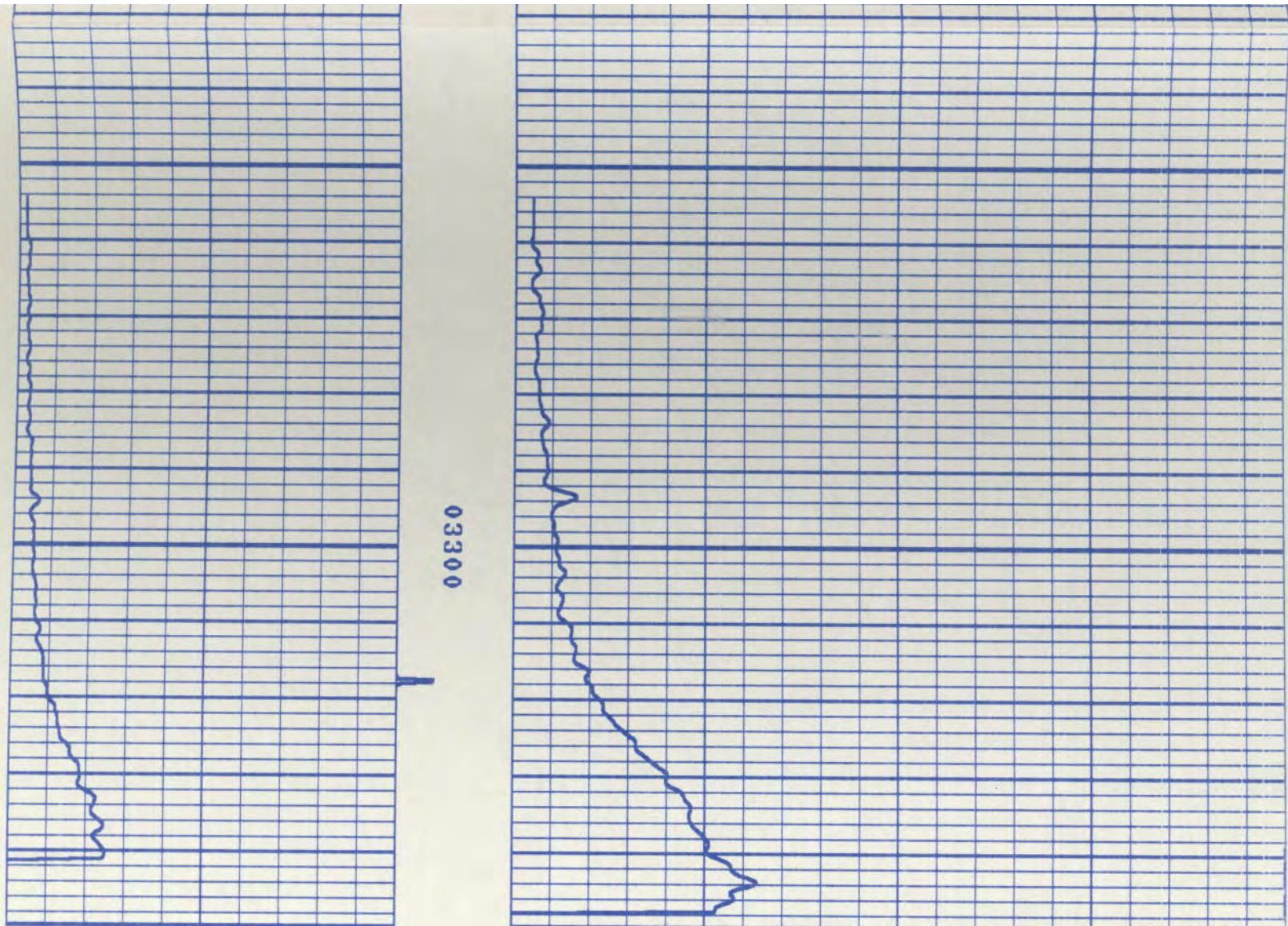
未未未
NONE 未未未

COMPANY: CELANESE CHEMICAL COMPANY INC.

CELANESE CHEMICAL COMPANY INC.

WELL NAME: NO. 2 WELL - WDW 14

RUN: 1



CCL

0100

TDET (CPS)

0

500

TEN (LBS)

5000

0

BDET (CPS)

0

500

FILE: 24

FILE: 23

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

SERVICE: F 150A

FILE: 23

DATE: 02/22/94

TIME: 18:38:22

CCL
0100

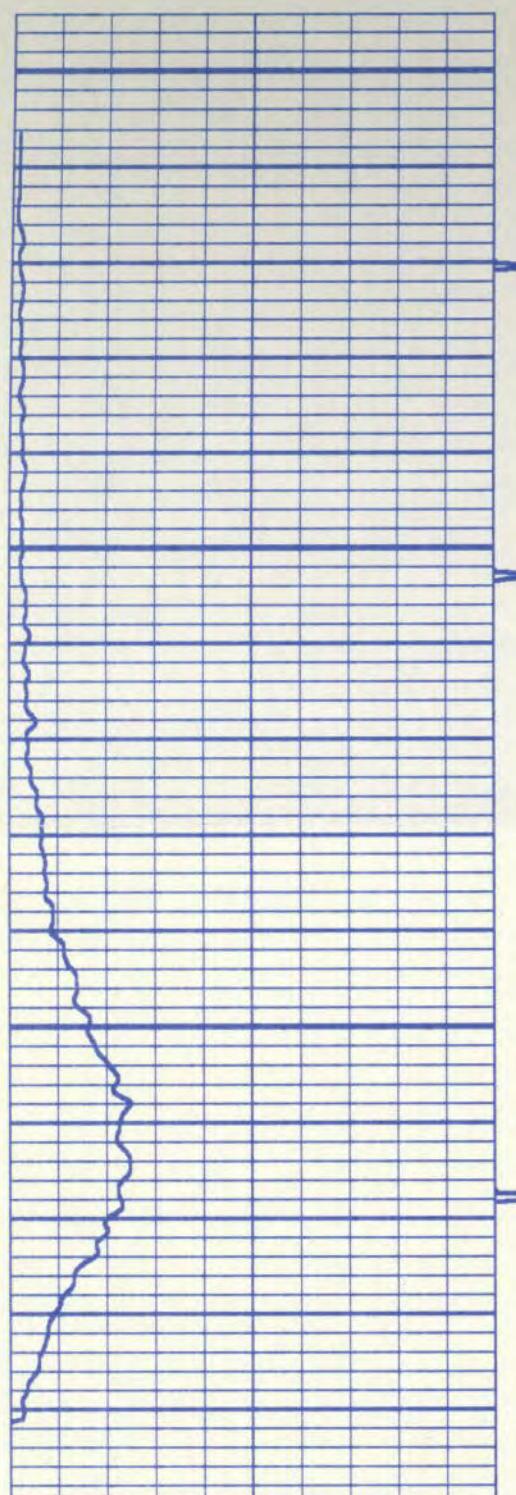
TEN (LBS)

5000

0

TDET (CPS)

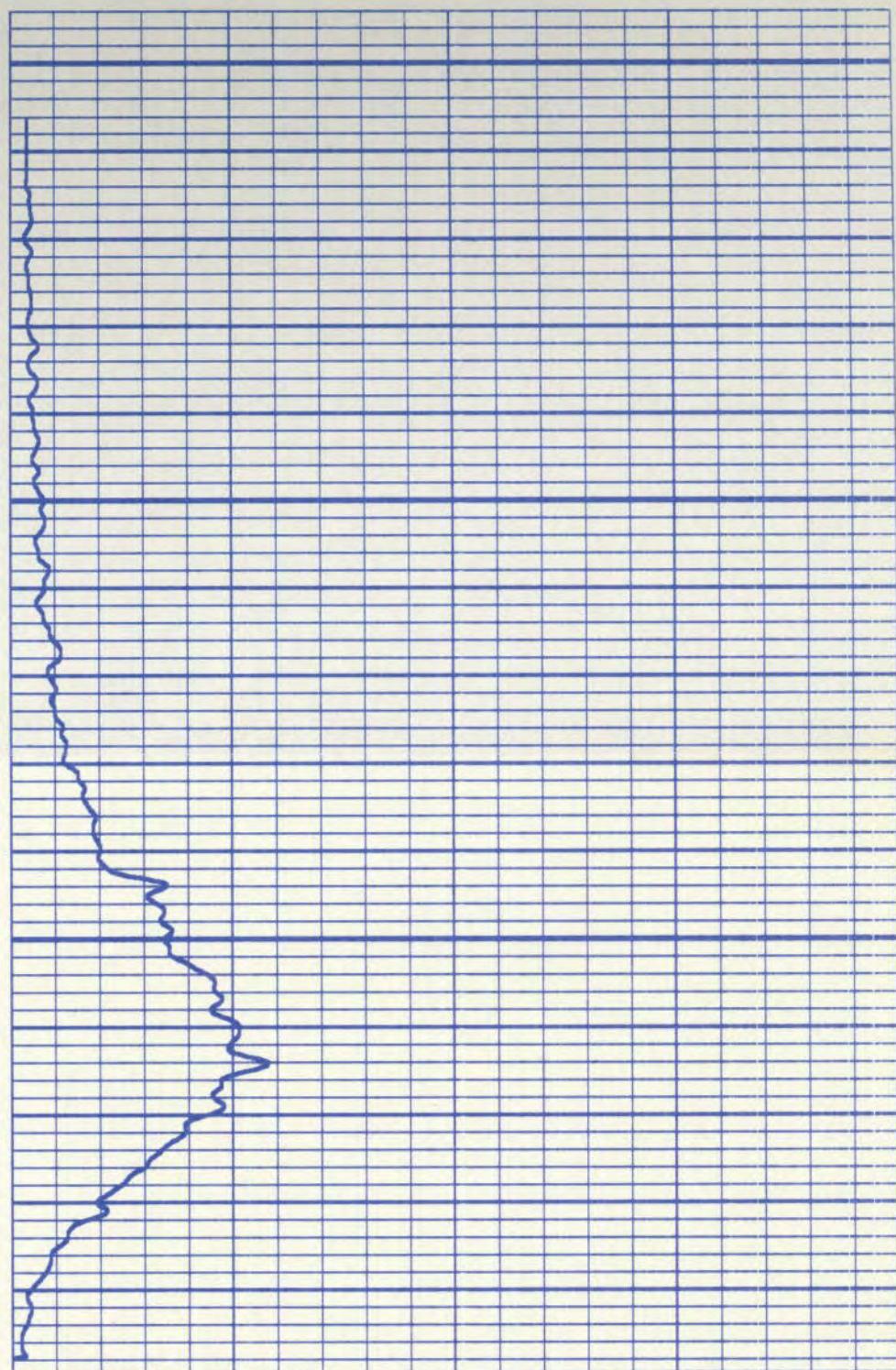
0 500



03200

BDET (CPS)

0 500

CCL
0100

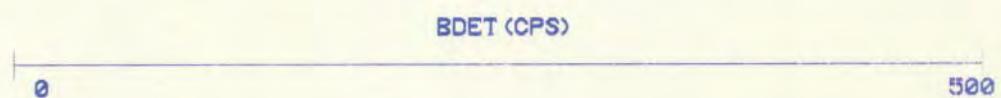
TEN (LBS)

5000

0

TDET (CPS)

0 500



FILE: 23

FILE: 22

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

SERVICE: F 150A FILE: 22

DATE: 02/22/94

TIME: 18:35:07

REVISION: FSYS256 REV:G002 VER:2.0

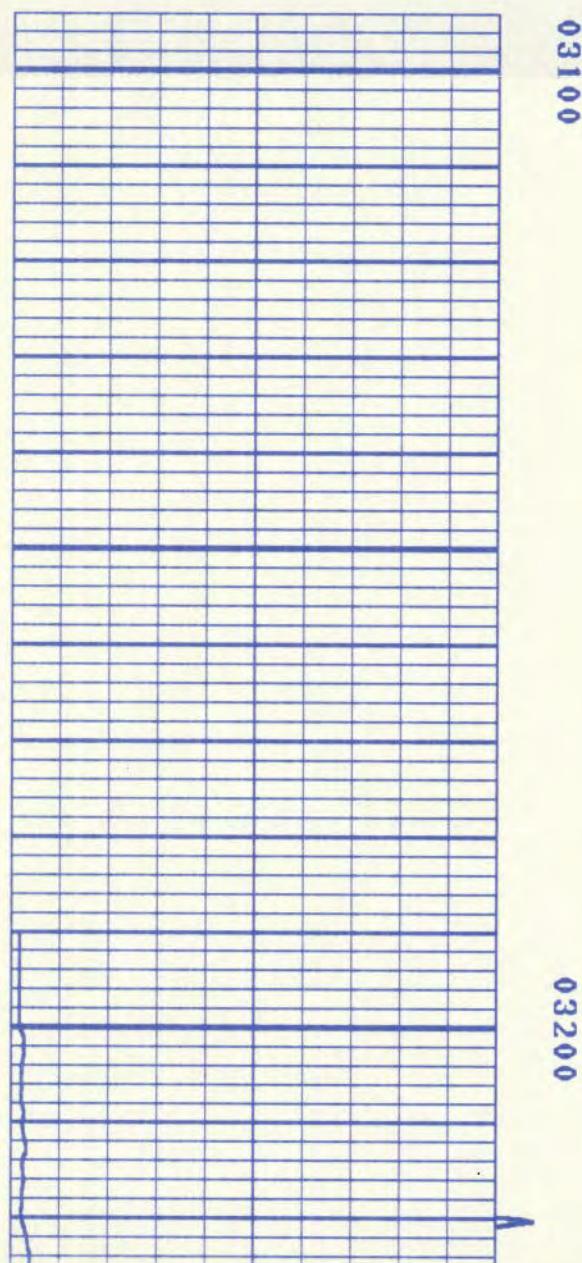
MODE: PLAYBACK

CCL
0100

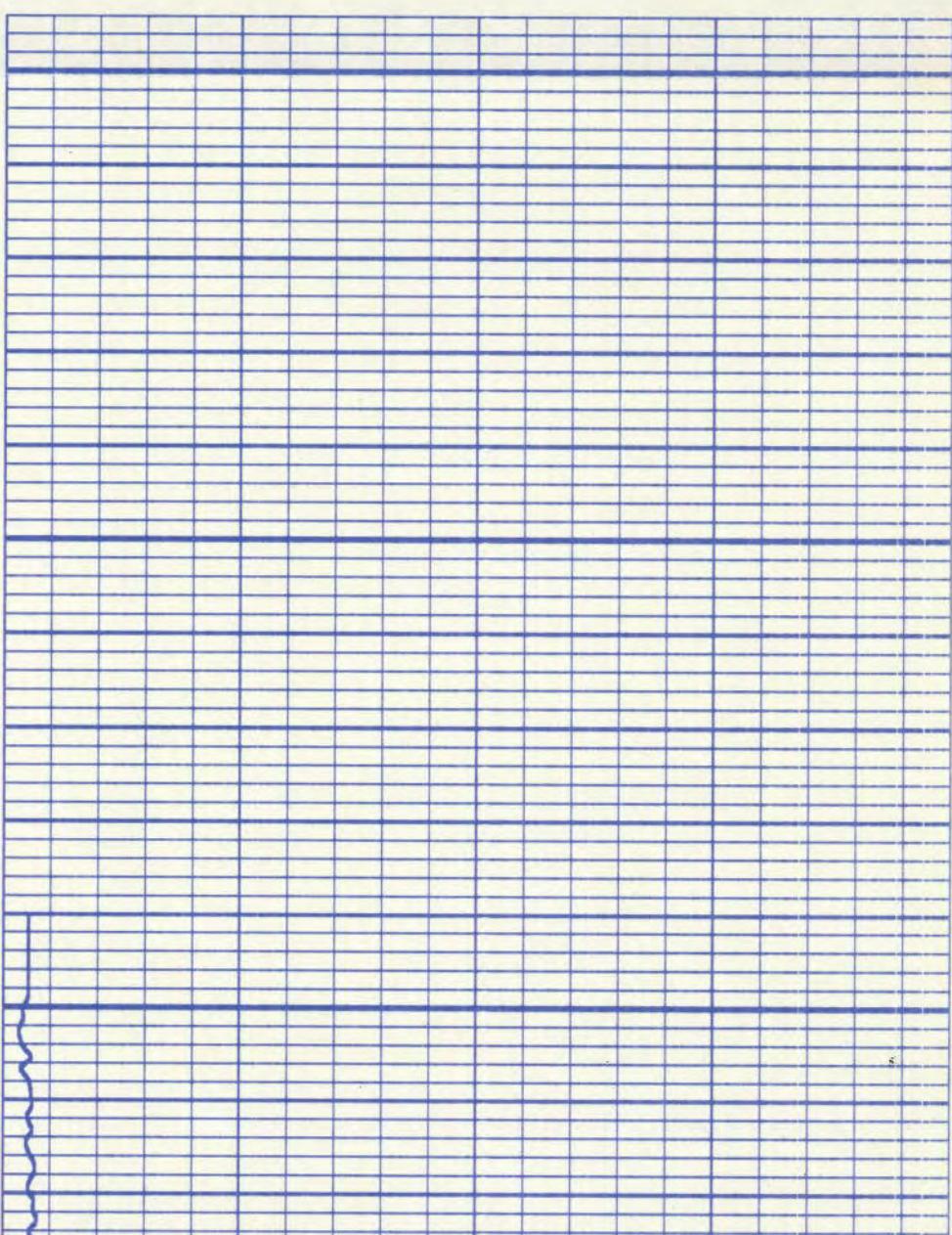
TEN (LBS)
5000

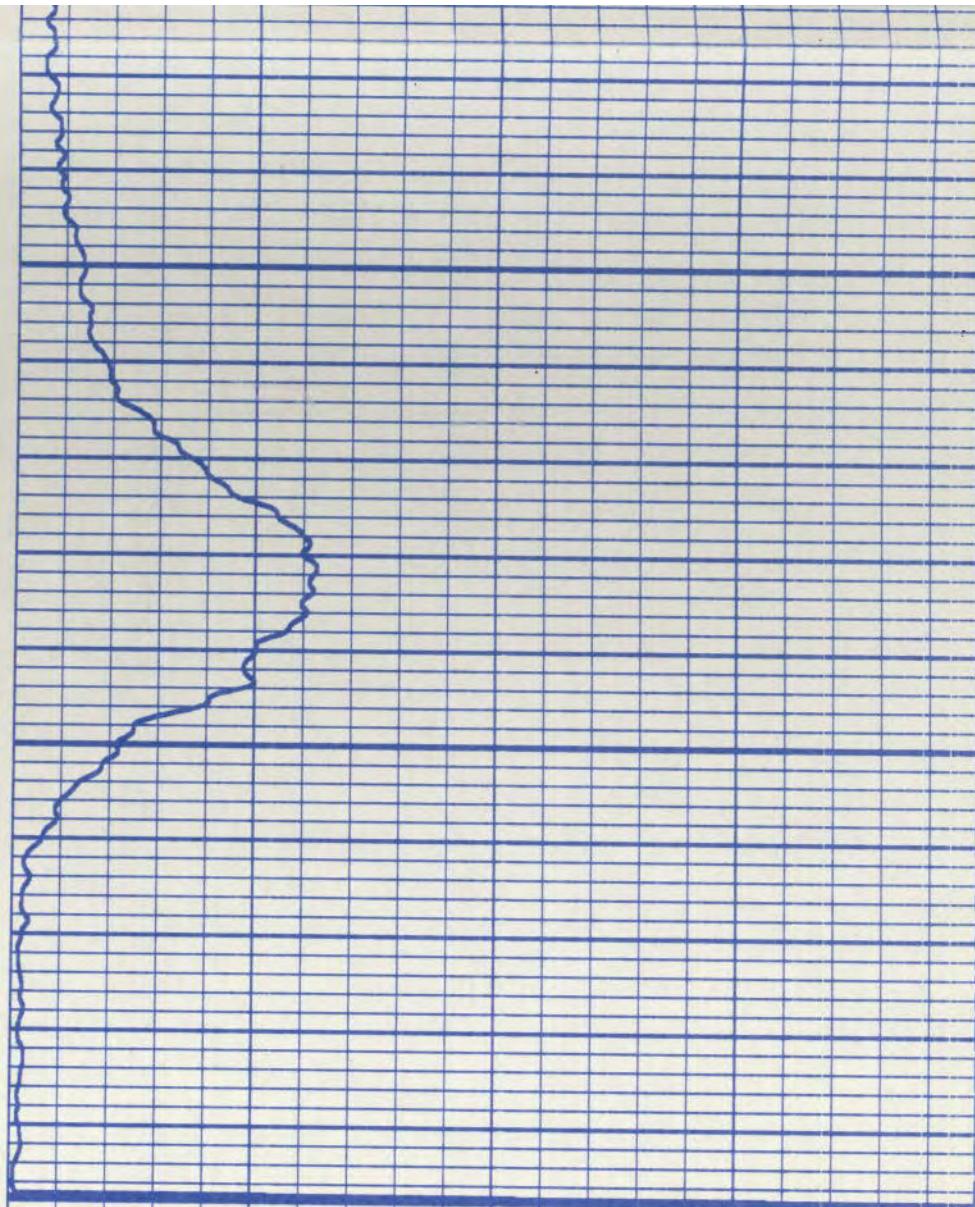
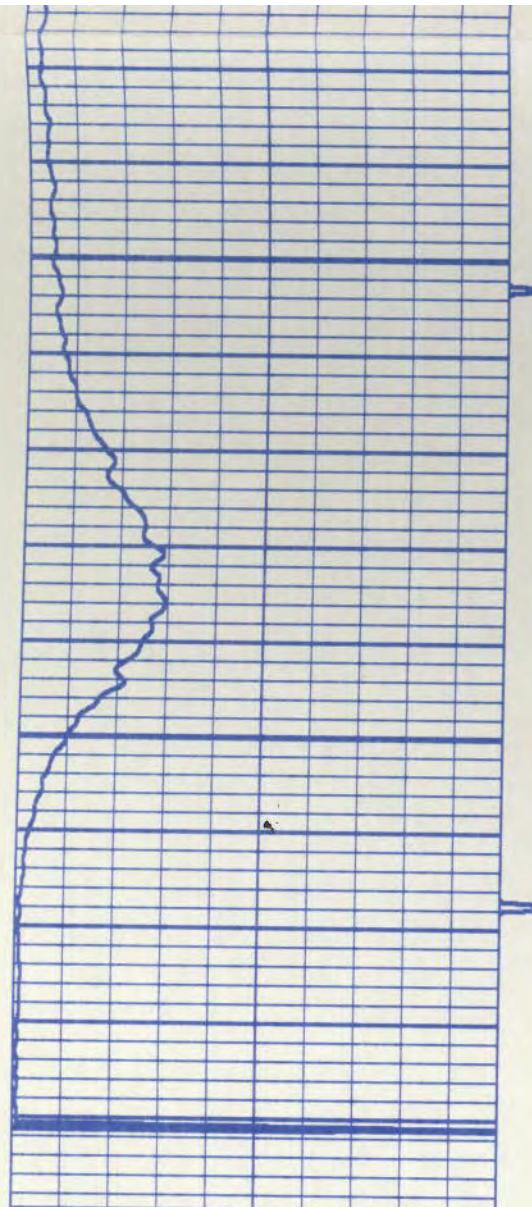
TDET (CPS)
0 500

BDET (CPS)
0 500



03100





CCL
0100

TDET (CPS)

0 500

TEN (LBS)

5000

BDEN (CPS)

0 500

FILE: 22

FILE: 21

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

SERVICE: F 150A

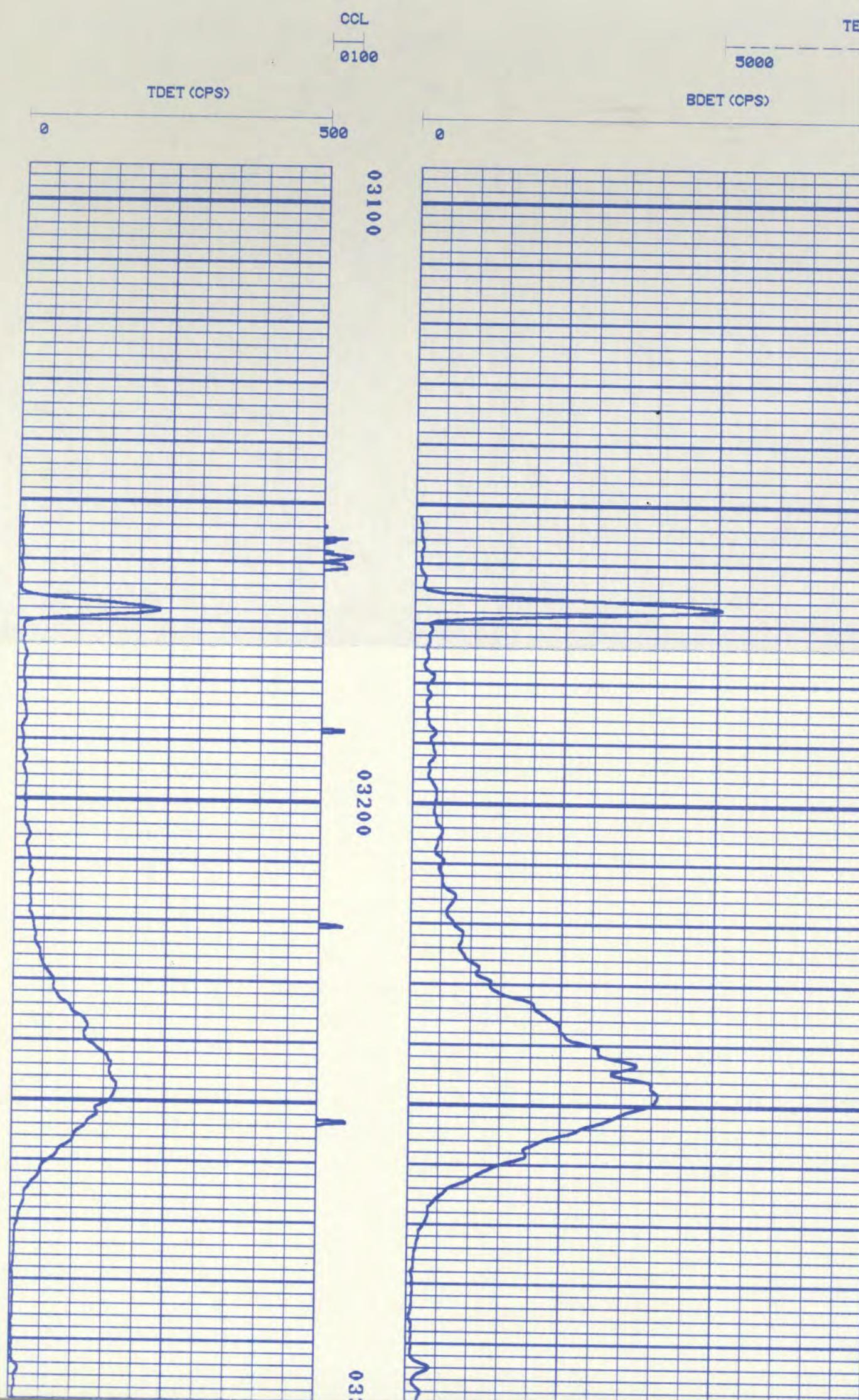
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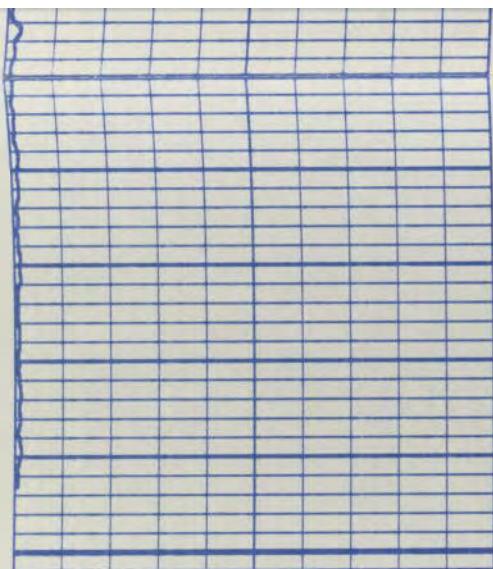
DATE: 02/22/94

TIME: 18:31:28

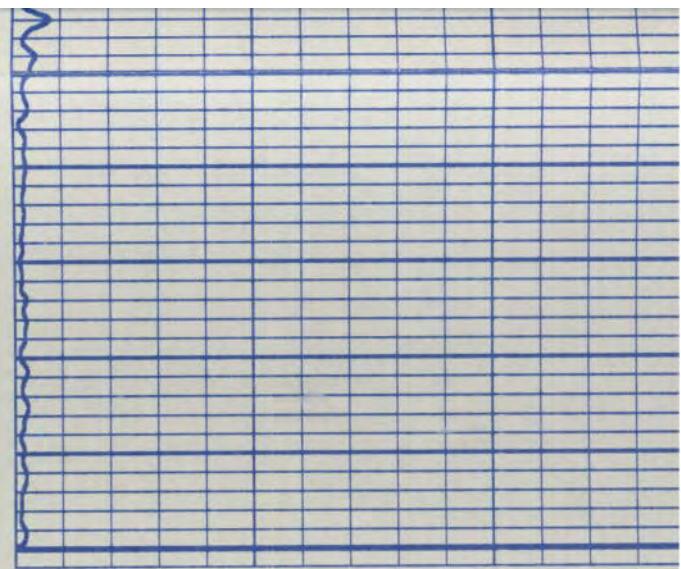
REVISION: FSYS256 REV:G002 VER:2.0

MODE: PLAYBACK





03300
CCL
0100



5000
BDET (CPS)
0

TDET (CPS)

0

500

BDET (CPS)

0

FILE: 21

FILE: 20

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

SERVICE: F 150A FILE: 20

DATE: 02/22/94

TIME: 18:28:37

REVISION: FSYS256 REV:G002 VER:2.0

MODE: PLAYBACK

CCL
0100

5000

TDET (CPS)

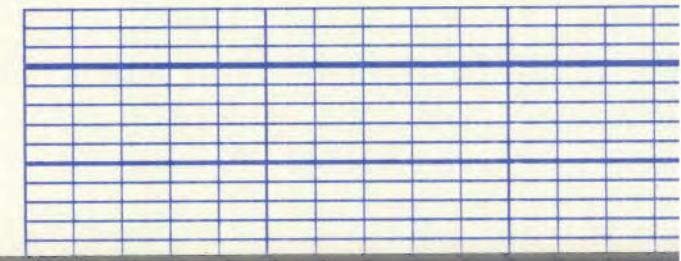
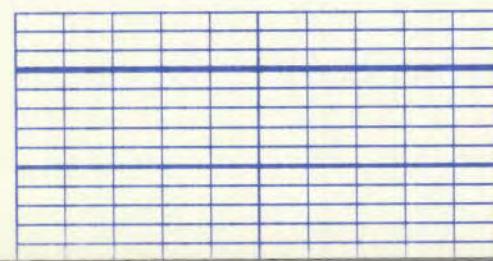
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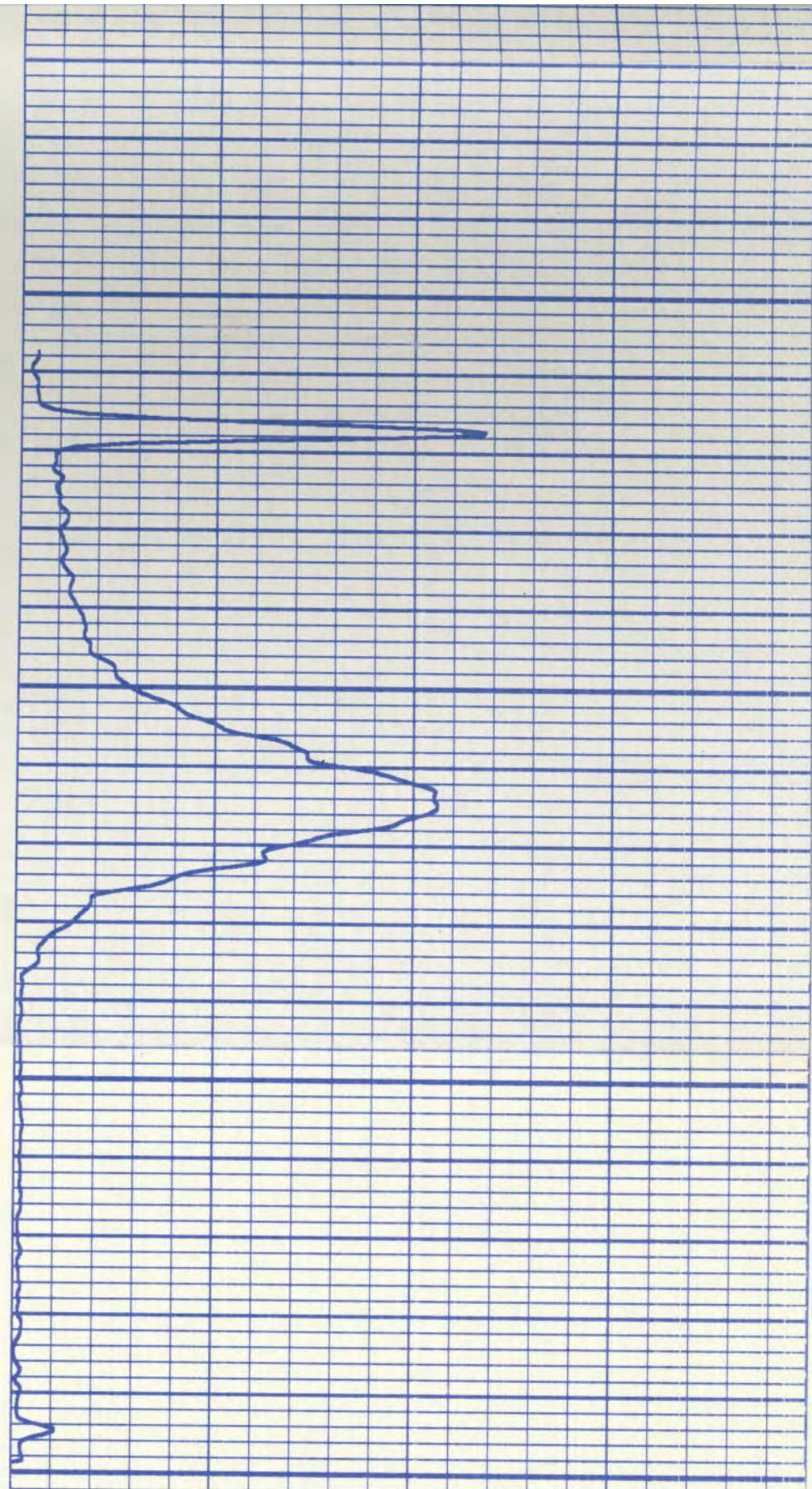
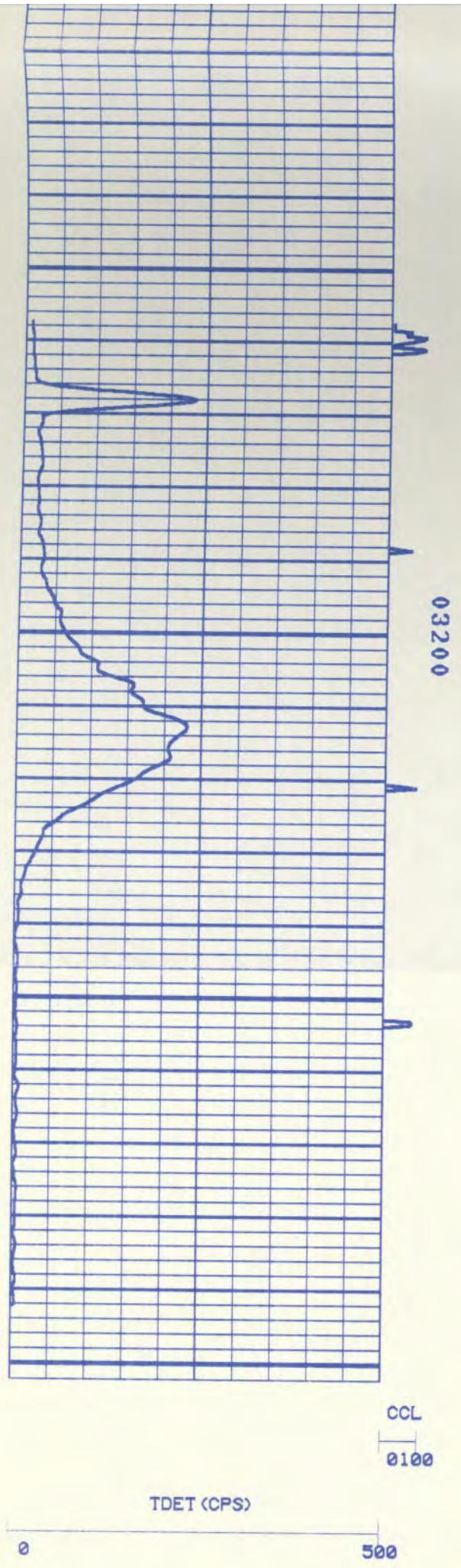
500

BDET (CPS)

0

03100





TDET (CPS)
0 500
0100 CCL

TEN (LBS)
5000 0
0 500 BDAT (CPS)

FILE: 20

FILE: 19

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

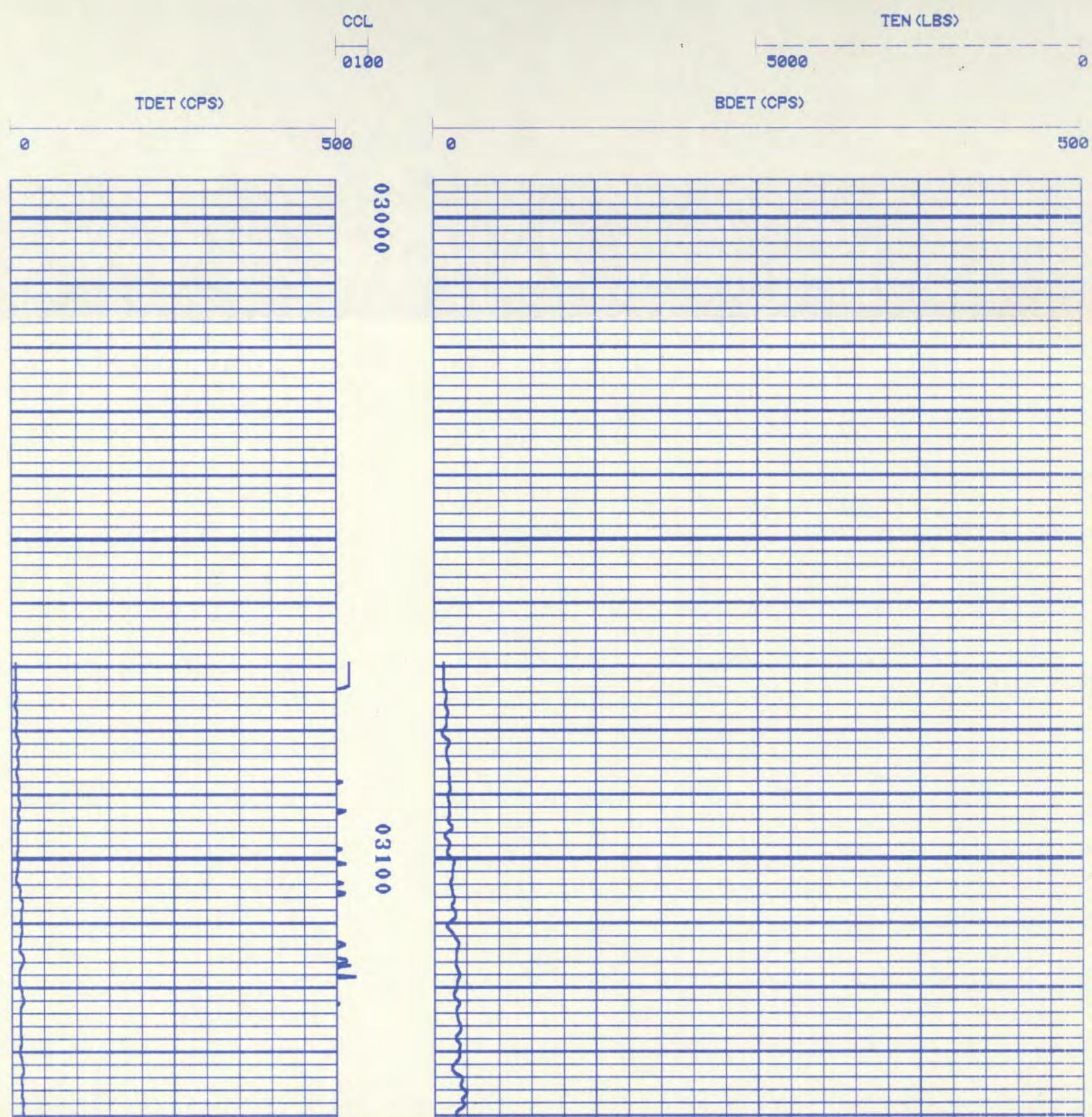
SERVICE: F 150A FILE: 19

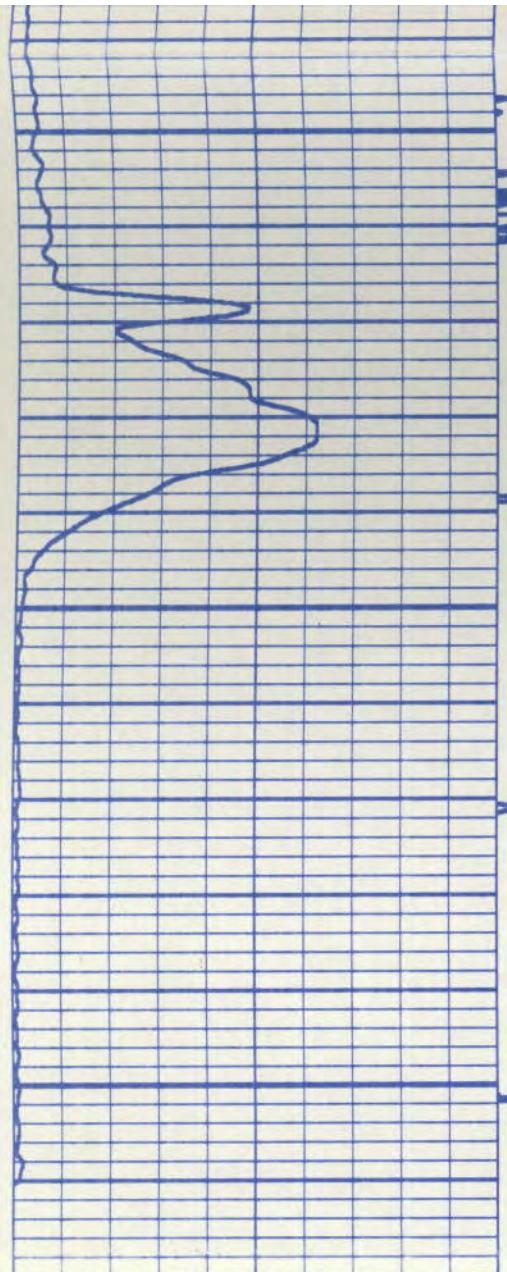
DATE: 02/22/94

TIME: 18:25:42

REVISION: FSYS256 REV:G002 VER:2.0

MODE: PLAYBACK

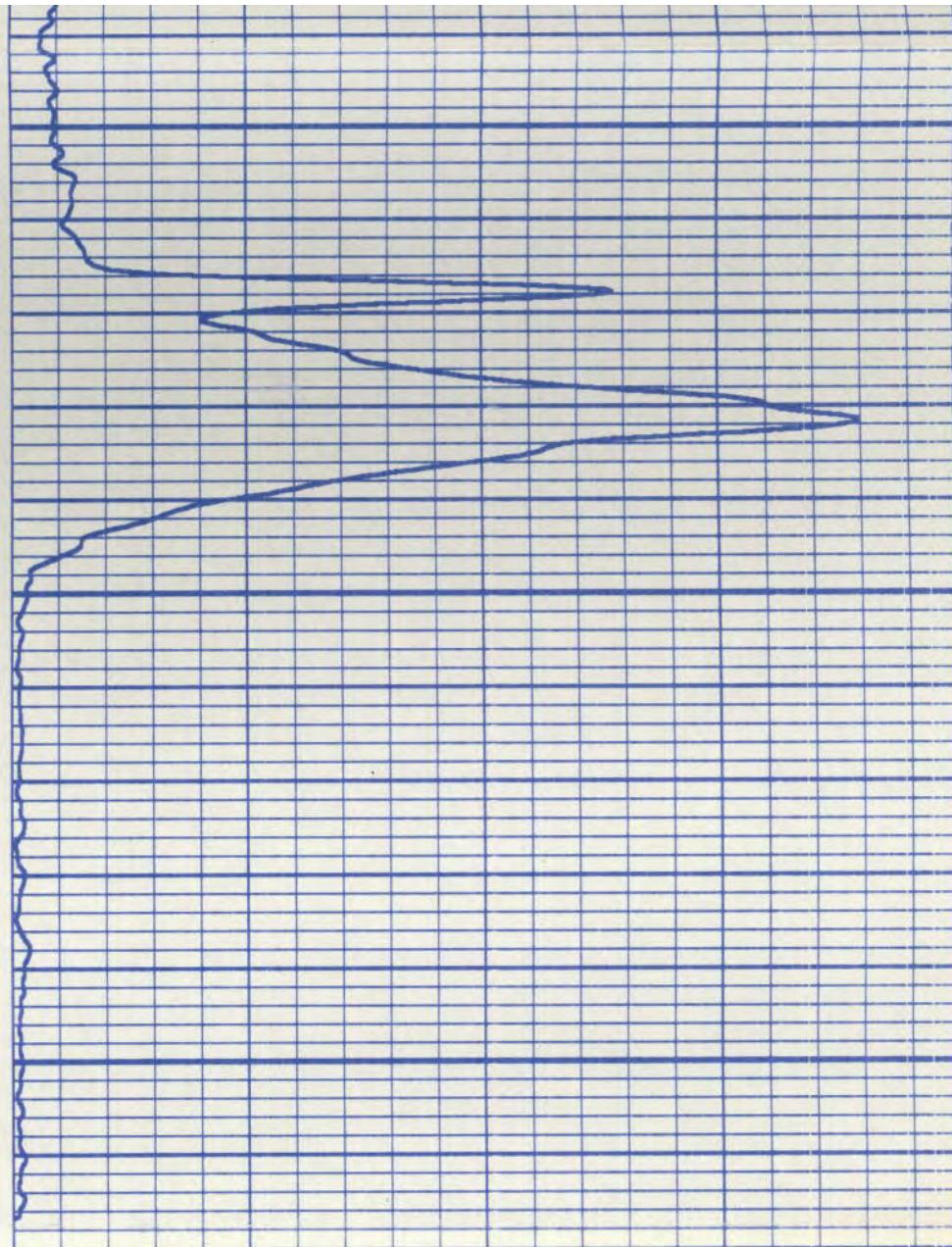




TDET (CPS)

0 500

CCL
0100



BDET (CPS)

0 5000 10000

TEN (LBS)
0

FILE: 19

FILE: 18

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

CELL NAME: NO. 2 CELL - UDU 14

TRIP: 1

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

SERVICE: F 150A FILE: 18

DATE: 02/22/94

TIME: 18:22:00

REVISION: FSYS256 REV:G002 VER:2.0

MODE: PLAYBACK

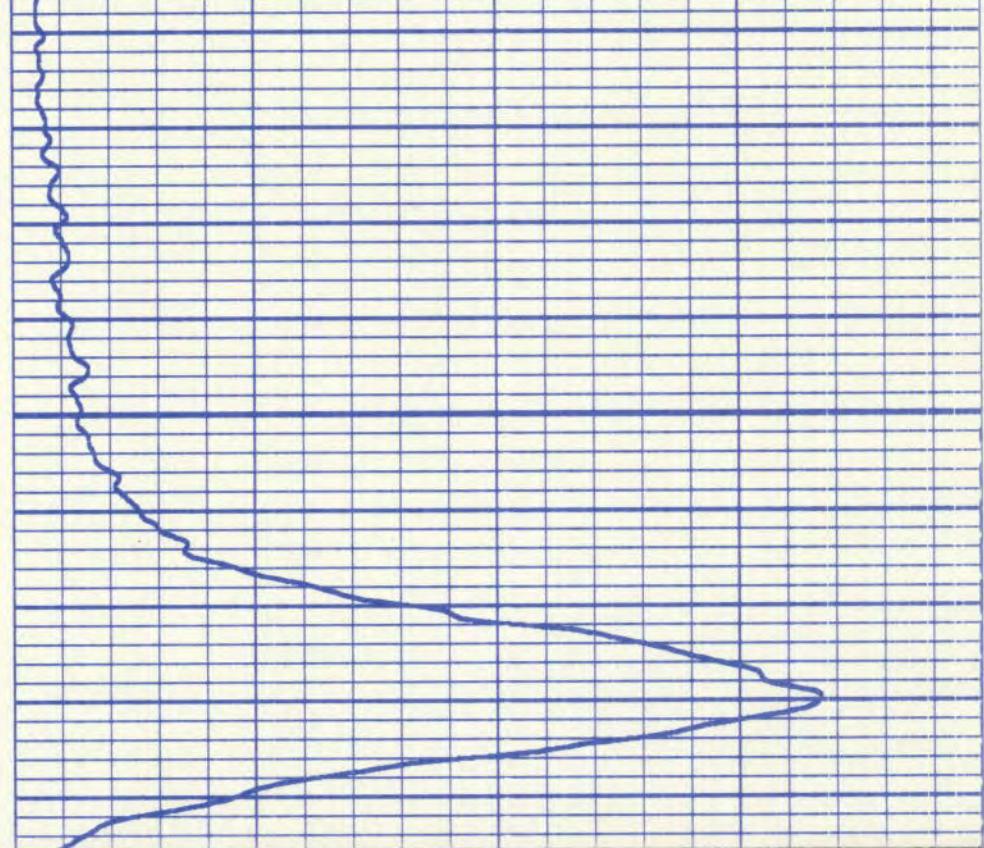
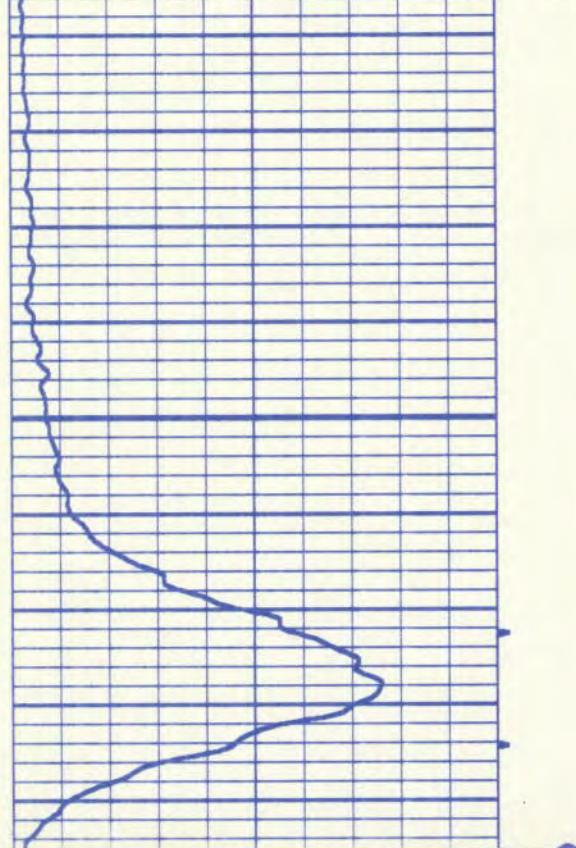
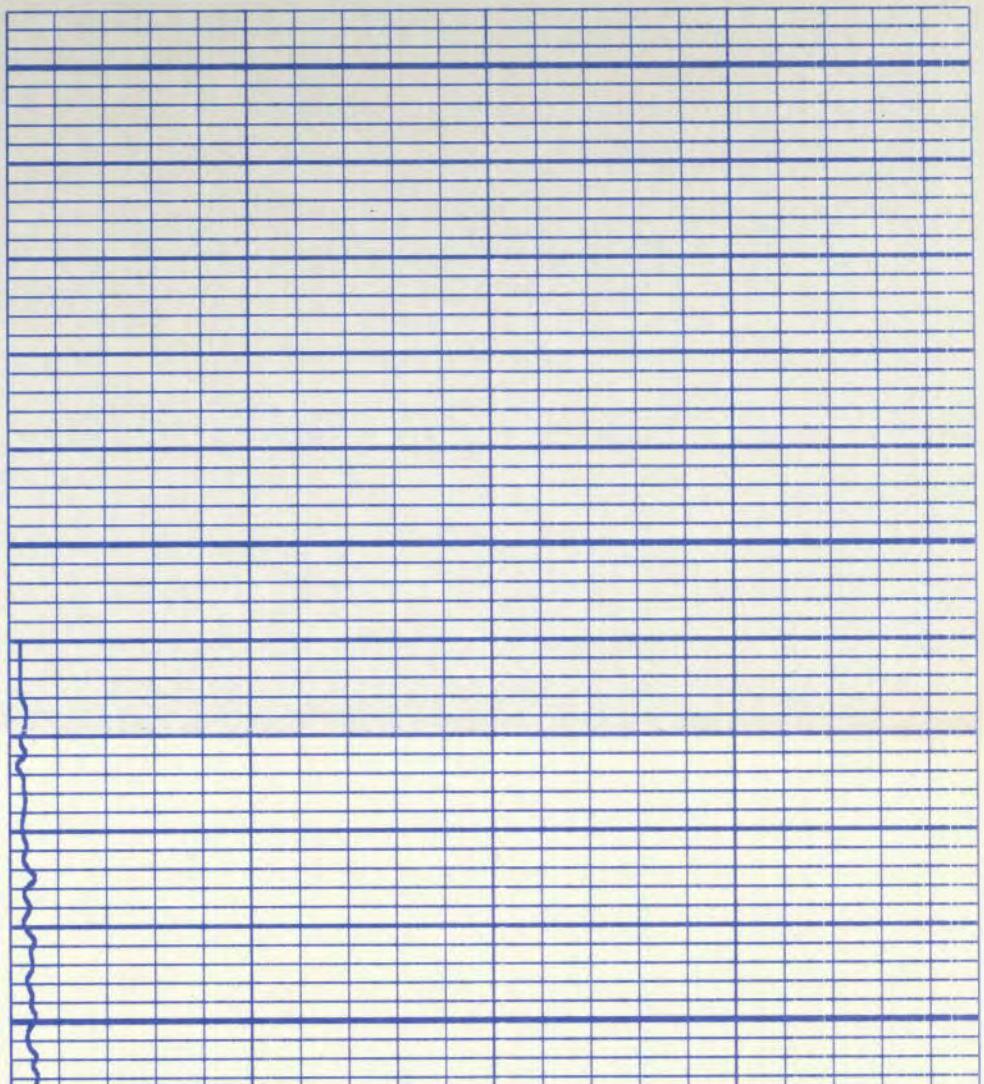
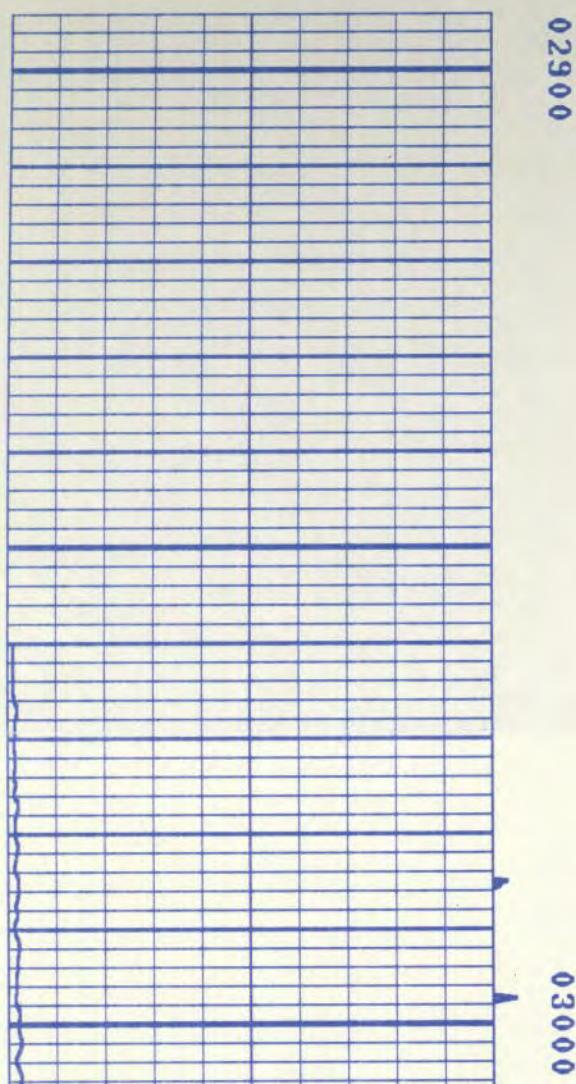


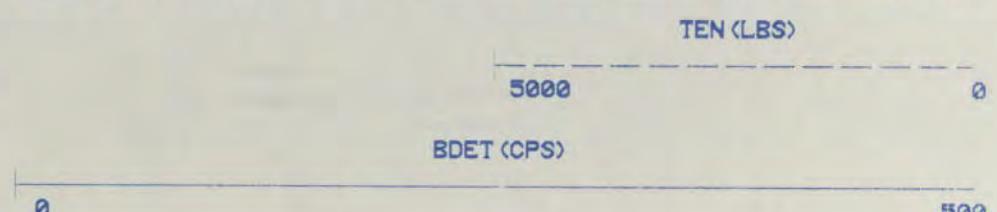
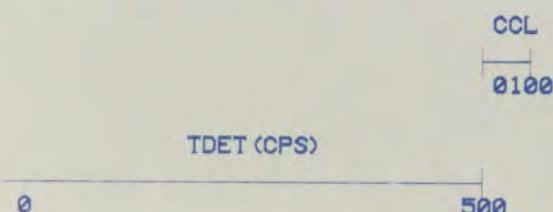
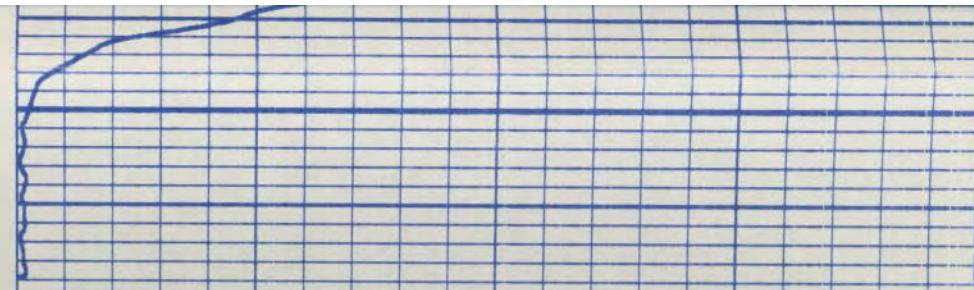
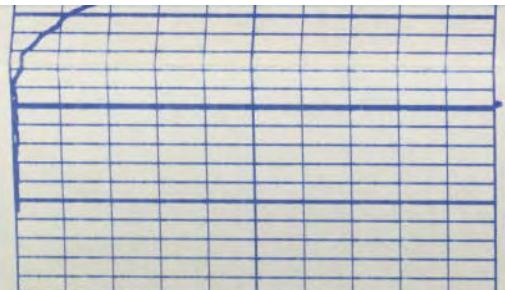
TDET (CPS)

BDET (CPS)

0 500

0 500





FILE: 18

FILE: 17

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

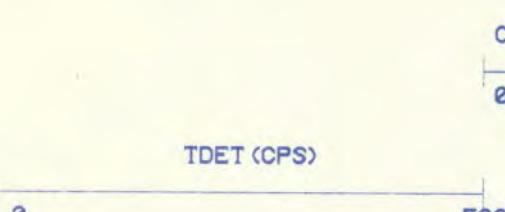
SERVICE: F 150A FILE: 17

DATE: 02/22/94

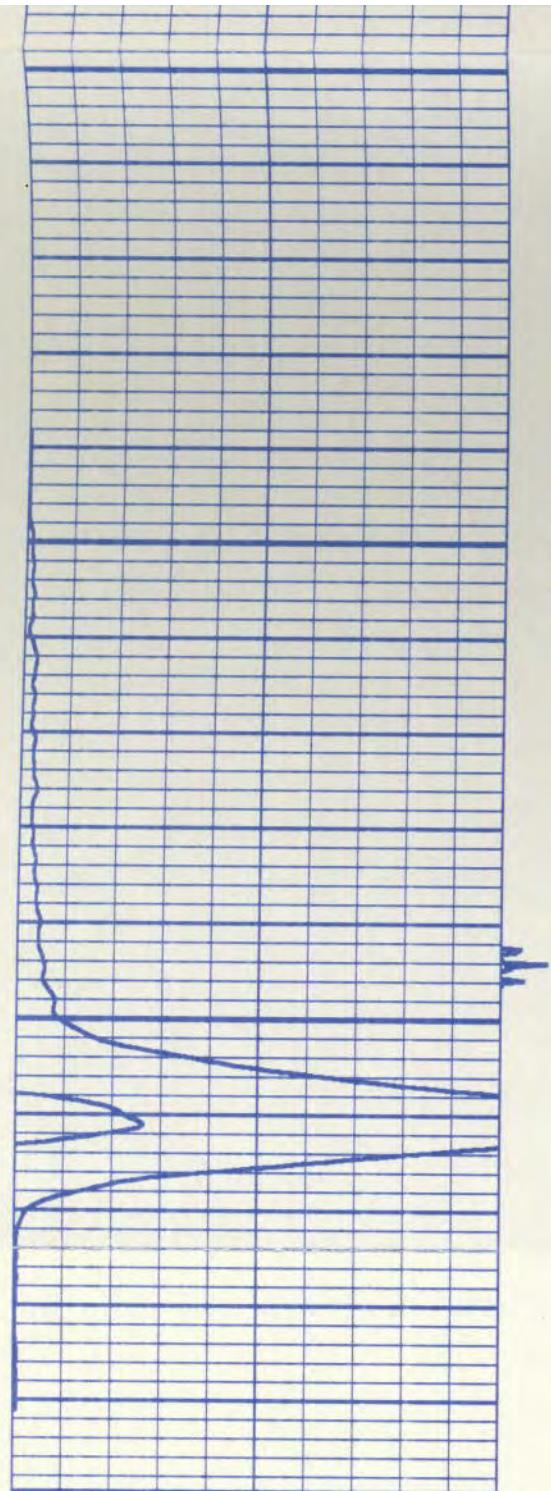
TIME: 18:18:20

REVISION: FSYS256 REV:G002 VER:2.0

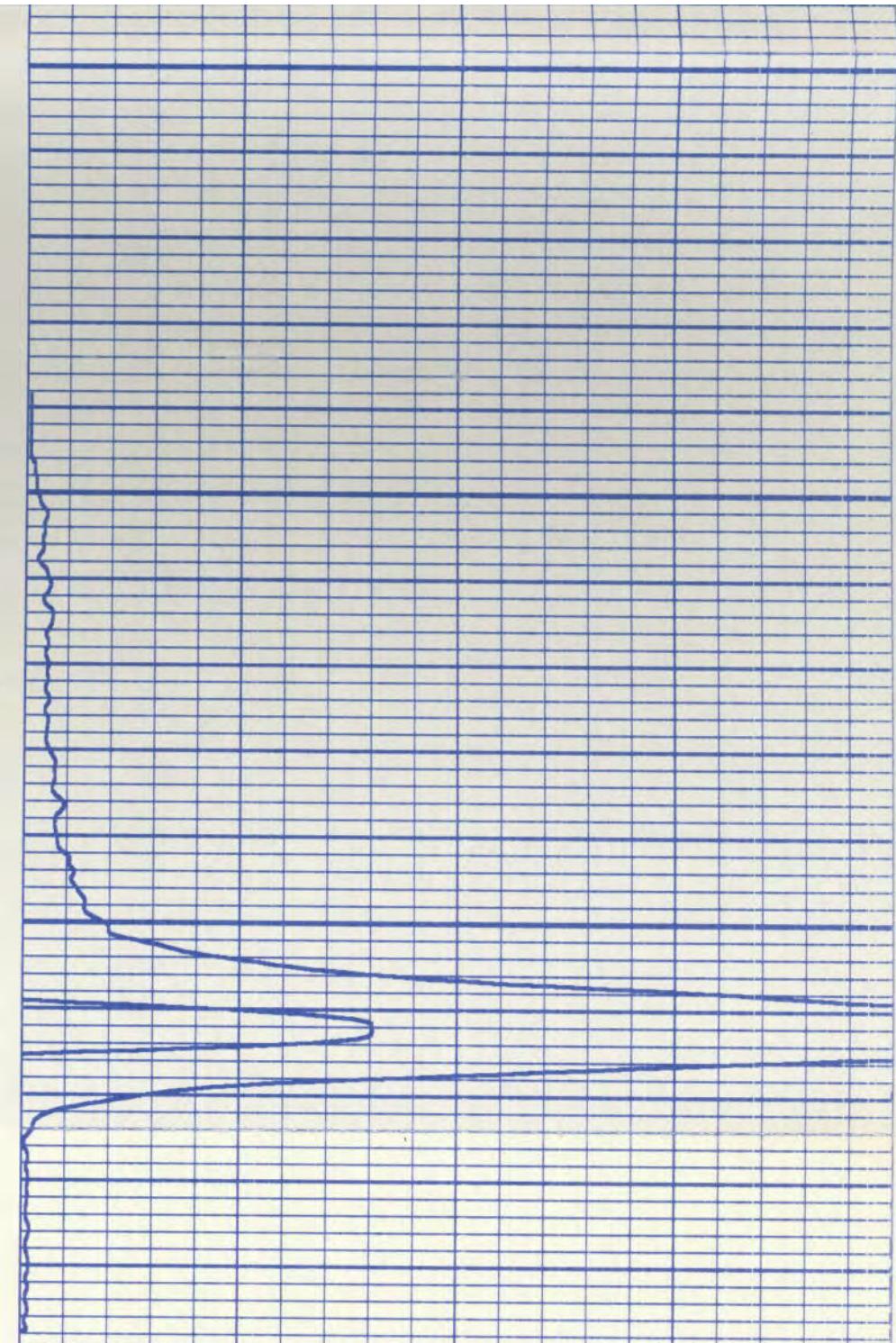
MODE: PLAYBACK



02800



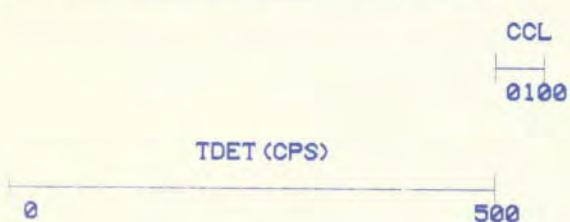
02900



TEN (LBS)

5000

0



FILE: 17

CHASE DOWN WITH A PUMP-IN RATE
OF 20 GPM. SHOT TAKEN AT
2900 FT. TIME 1700 HRS.

2900 FT. TIME 1700 HRS.

FILE: 36

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
TDET	6,6	FT,IN
BDET	0	FT,IN
CCL	16,0	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

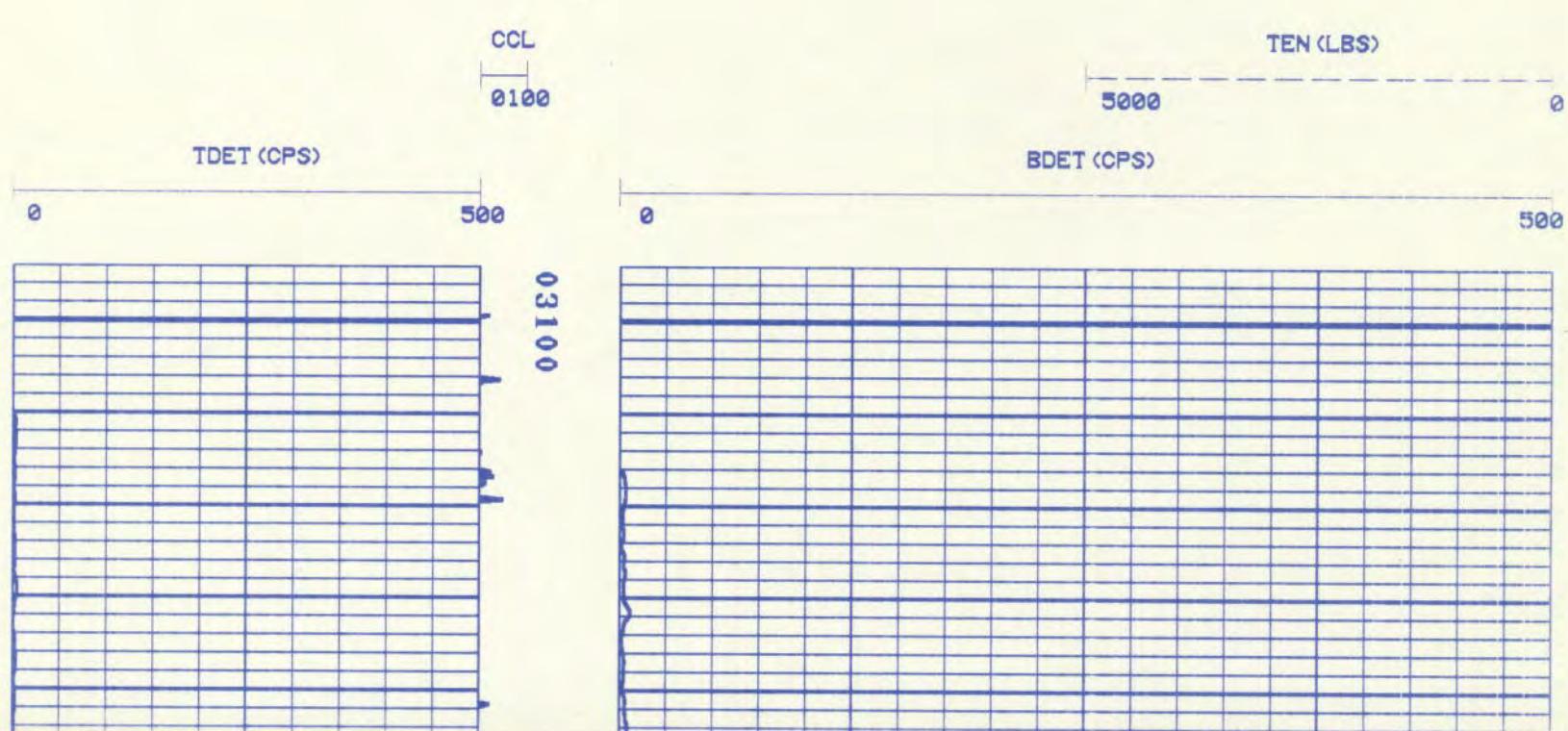
SERVICE: F 150A FILE: 36

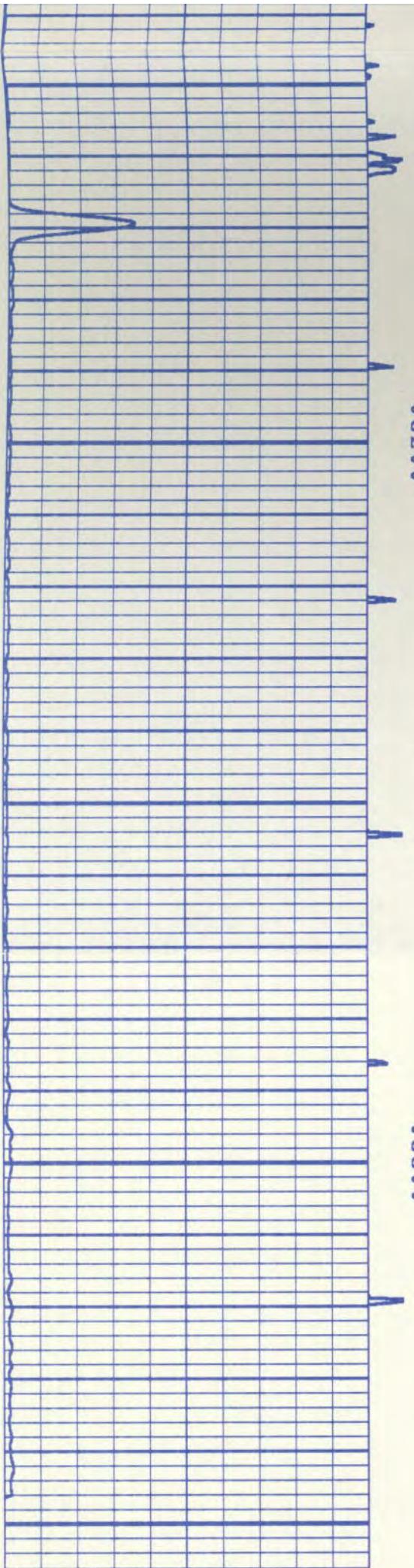
DATE: 02/22/94

TIME: 19:29:19

REVISION: FSYS256 REV:G002 UER:2.0

MODE: RECORD





03200

03300

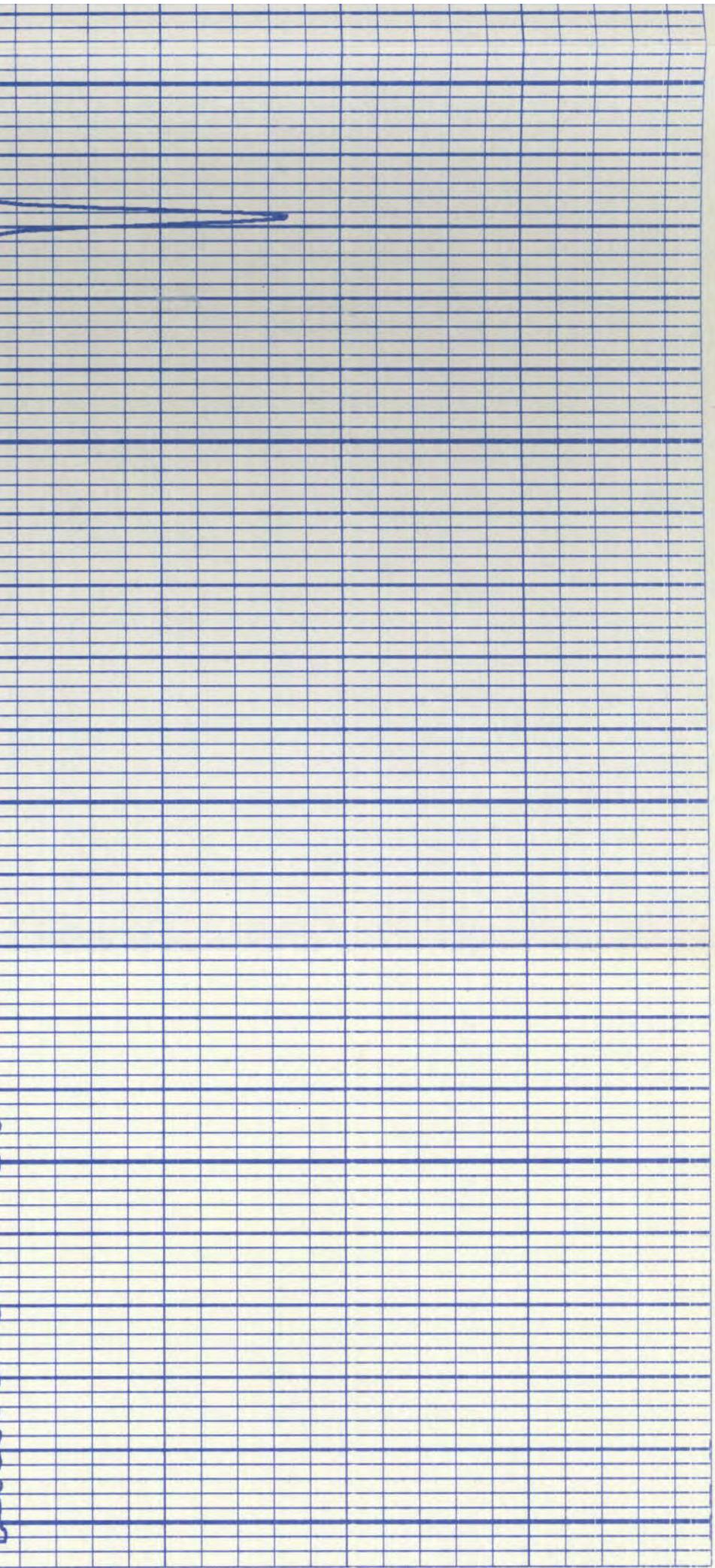
CCL

0100

TDET (CPS)

0

500



TEN (LBS)

5000

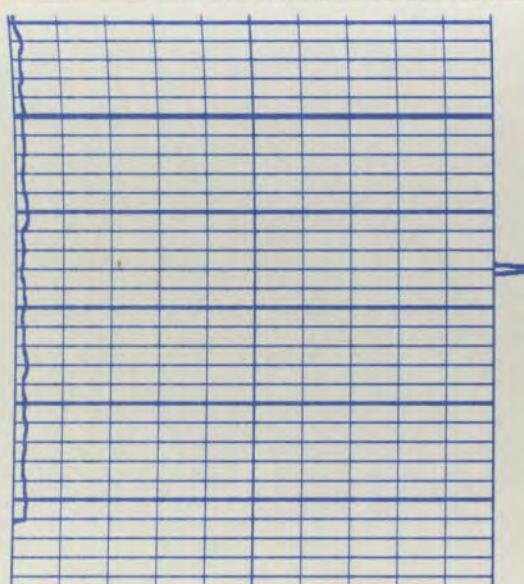
0

BDET (CPS)

0

500

FILE: 36

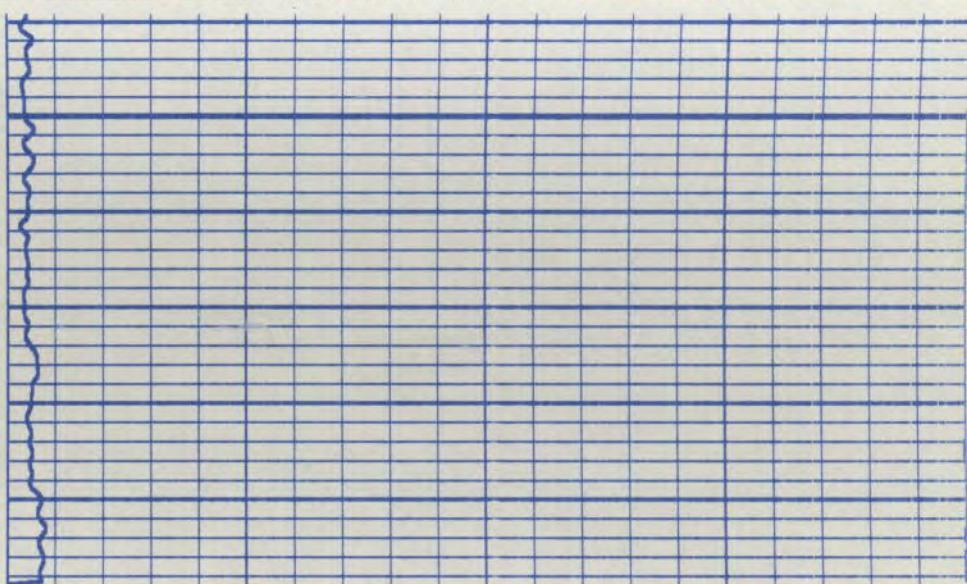


03300

CCL
0100

TDET (CPS)

0 500



TEN (LBS)

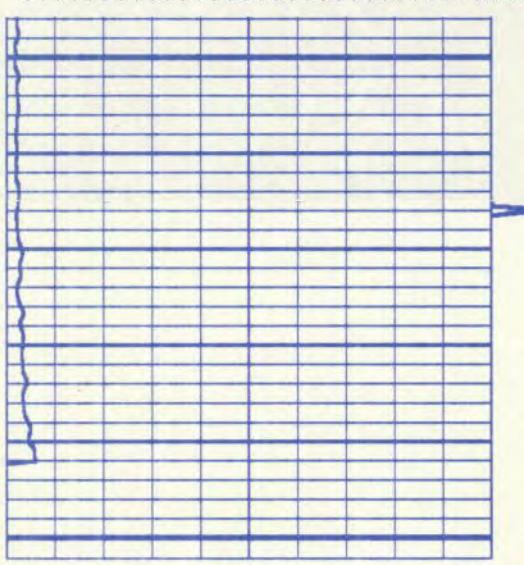
5000

0

BDET (CPS)

0 500

FILE: 35

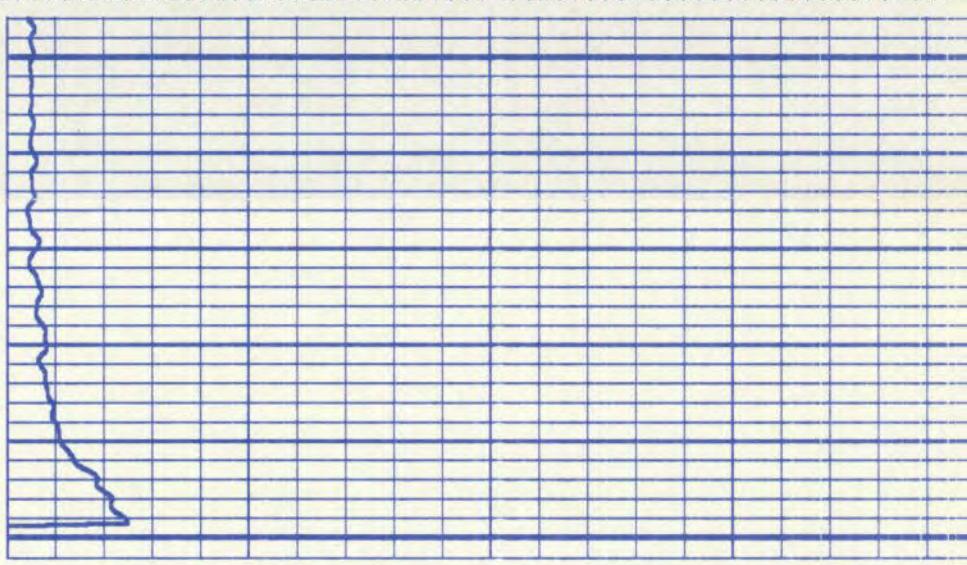


13300

CCL
0100

TDET (CPS)

0 500



TEN (LBS)

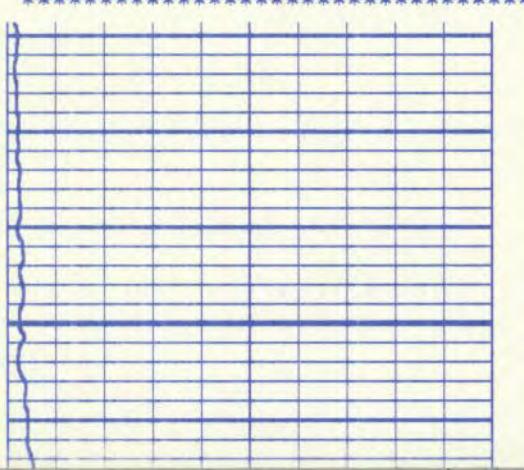
5000

0

BDET (CPS)

0 500

FILE: 34

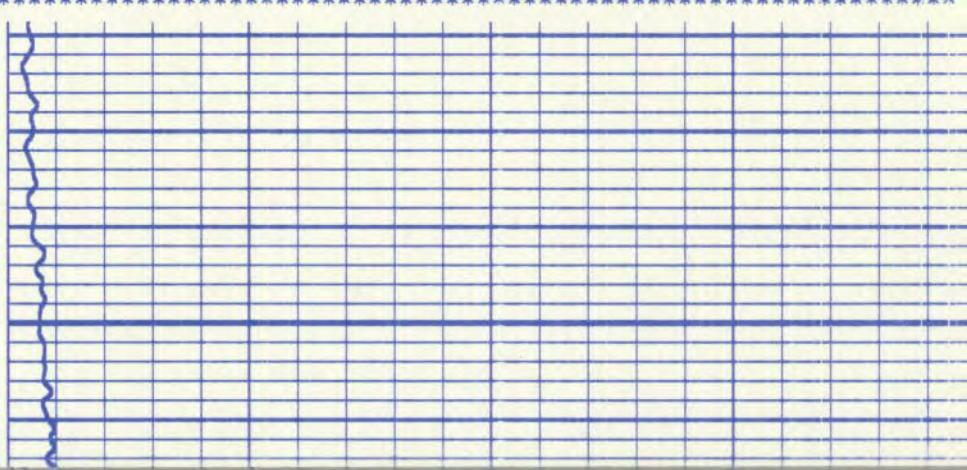


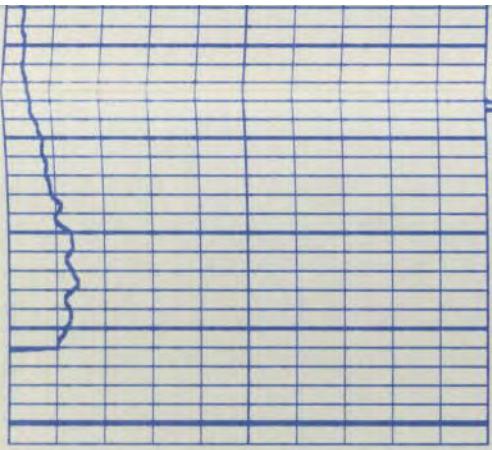
03300

CCL
0100

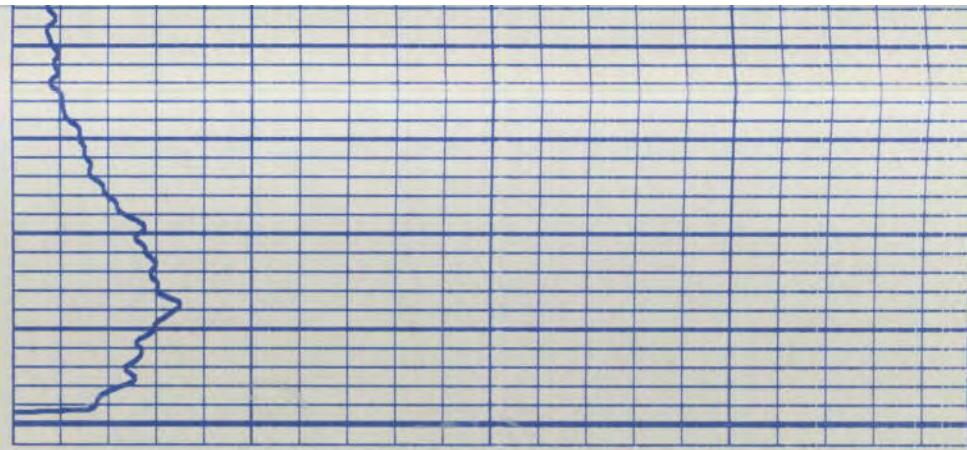
TDET (CPS)

0 500



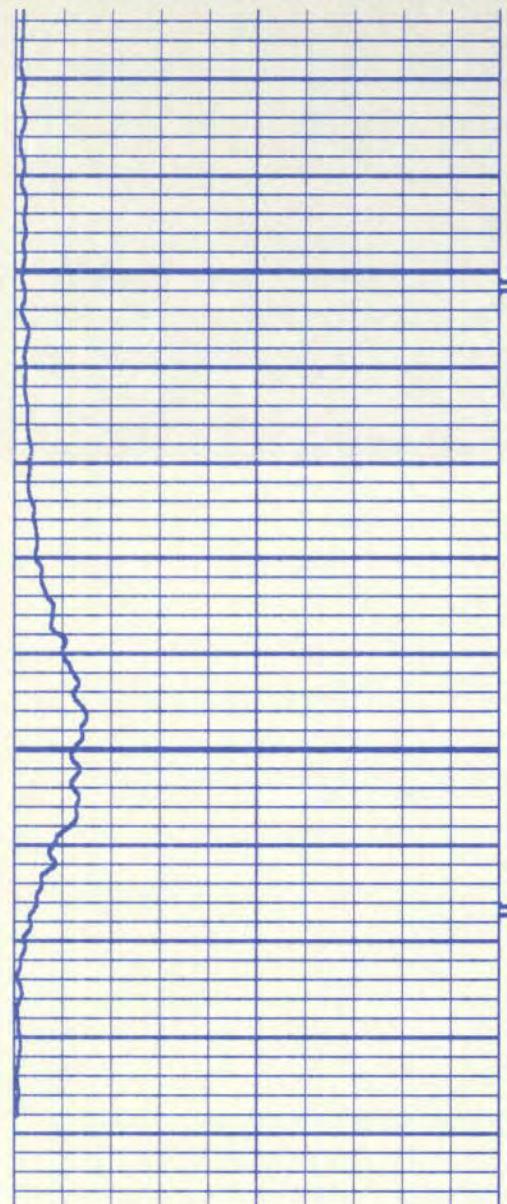


CCL
0100
TDET (CPS)
0 500



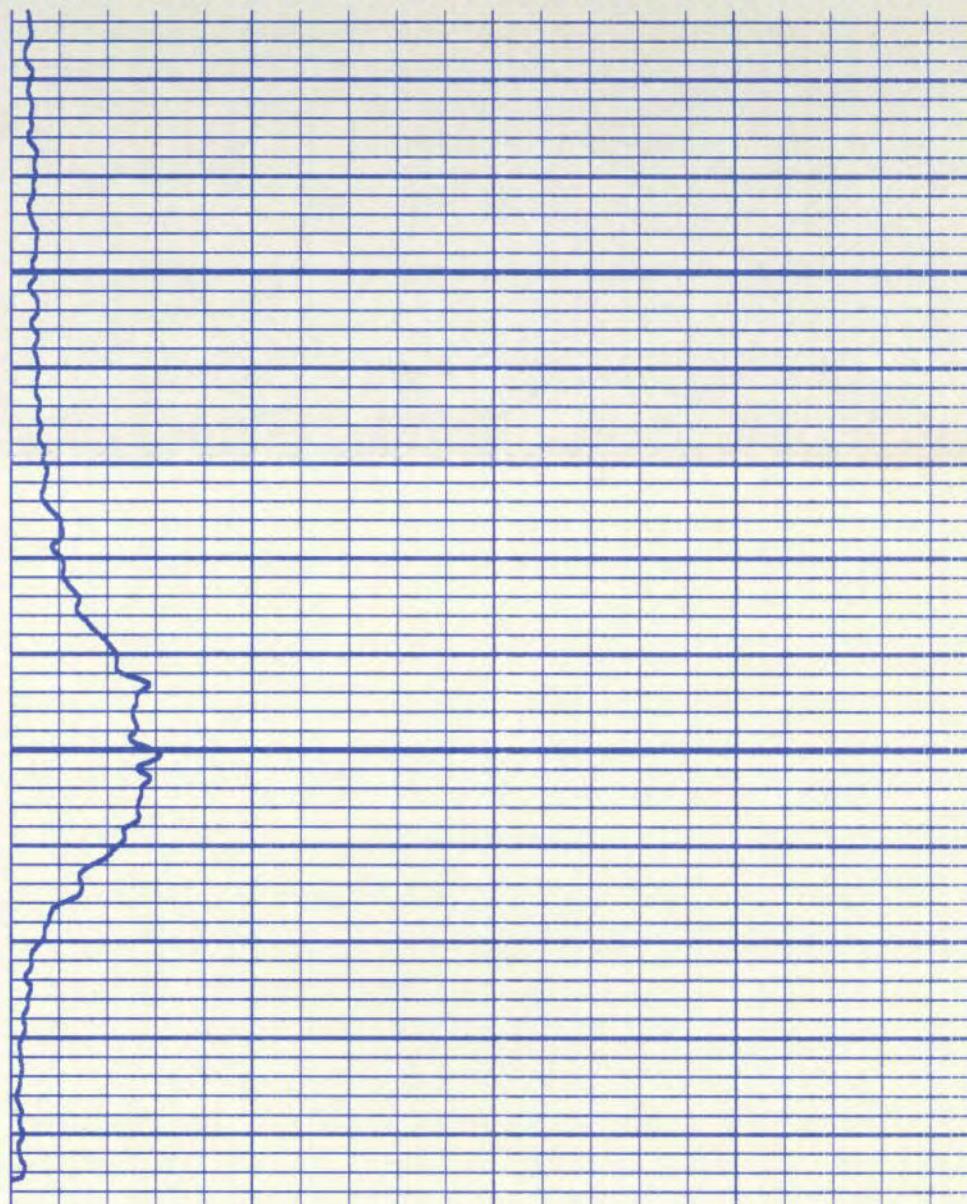
TEN (LBS)
5000 0
BDET (CPS)
0 500

FILE: 33



03300

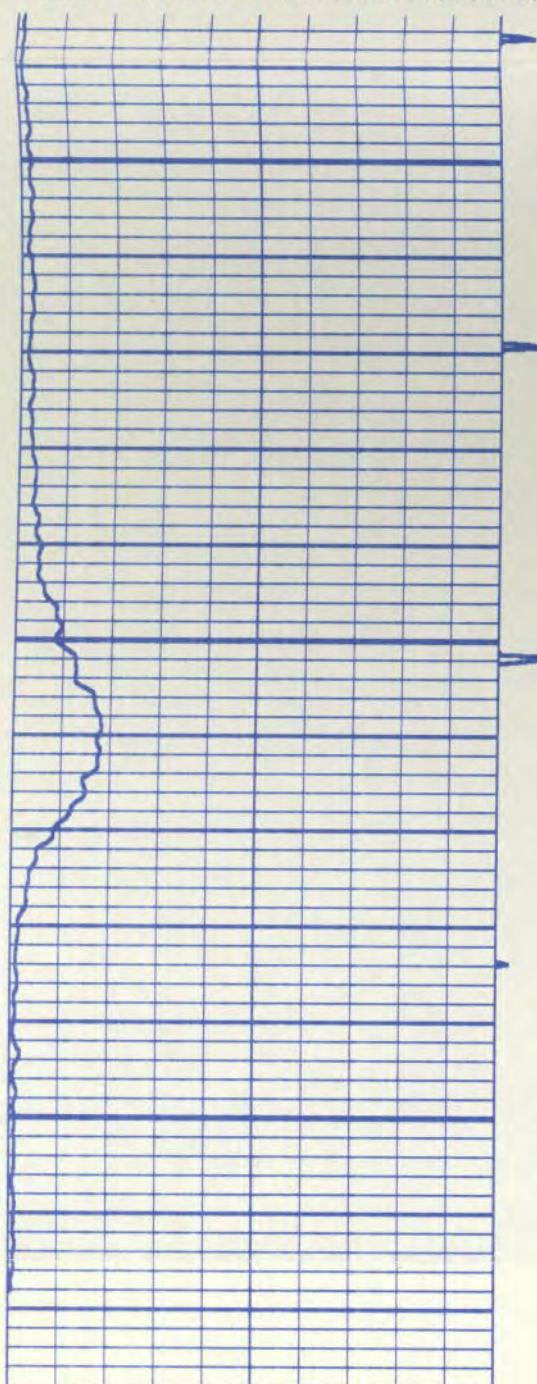
CCL
0100
TDET (CPS)
0 500



TEN (LBS)
5000 0
BDET (CPS)
0 500

FILE: 32



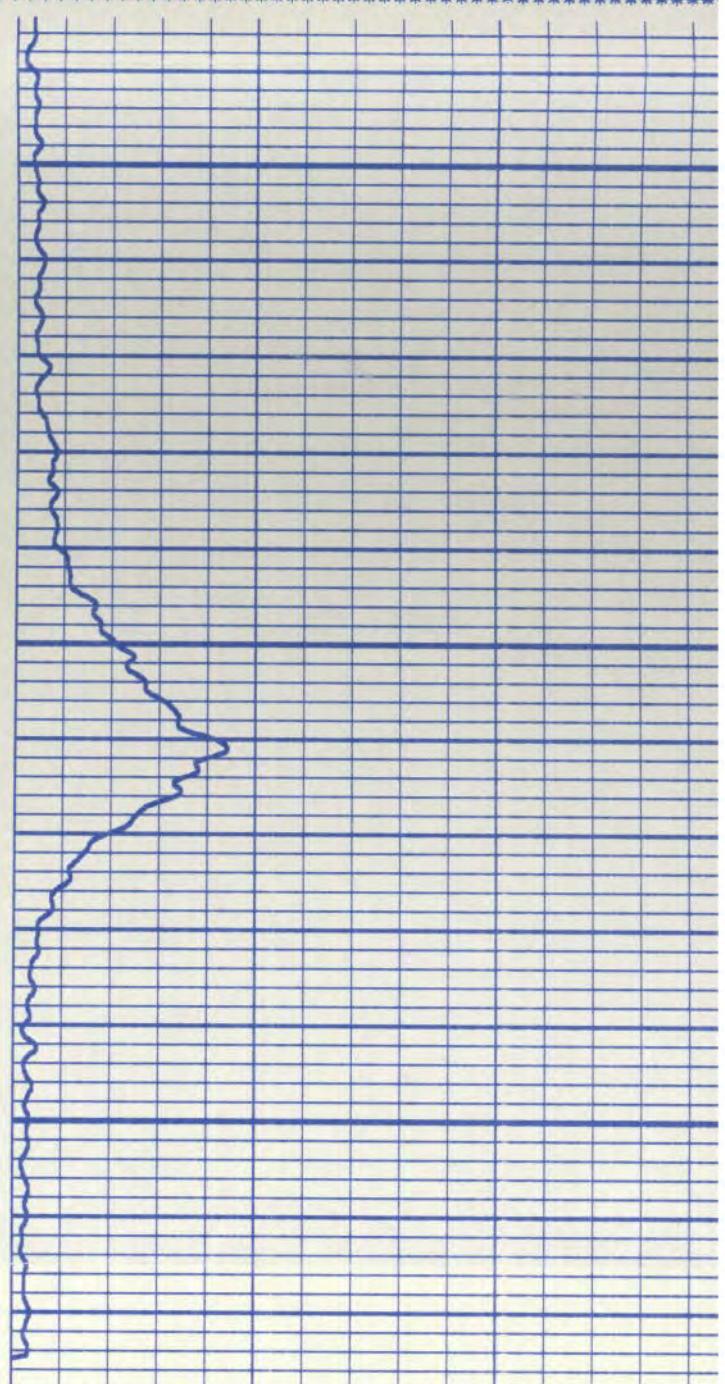


03200
03300

CCL
0100

TDET (CPS)

0 500

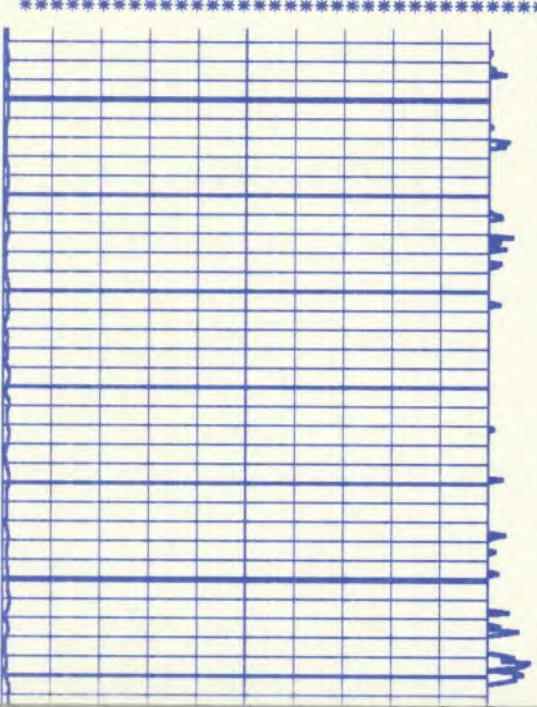


5000

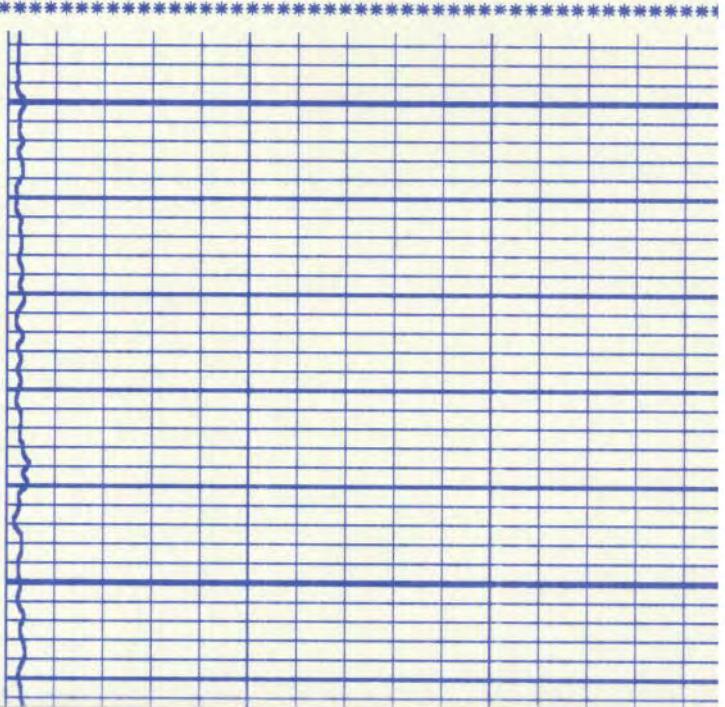
BDET (CPS)

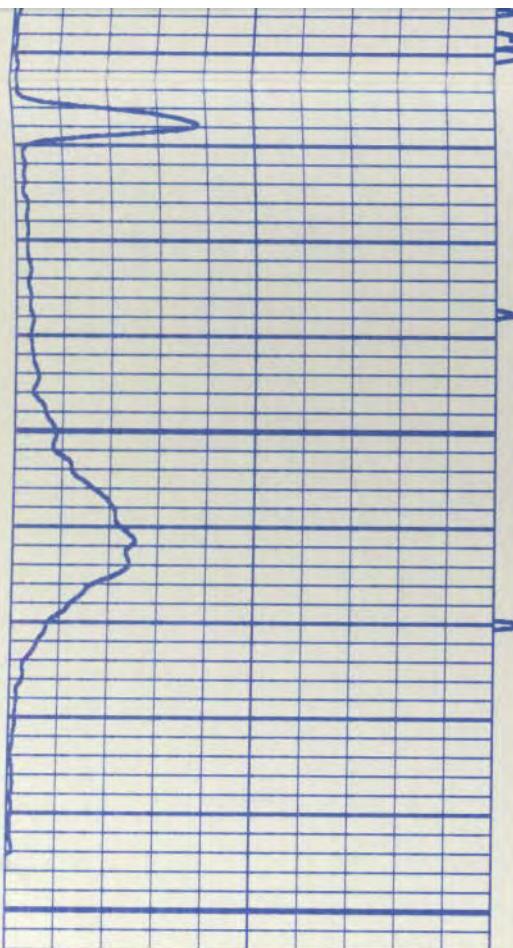
0

FILE: 31



03100



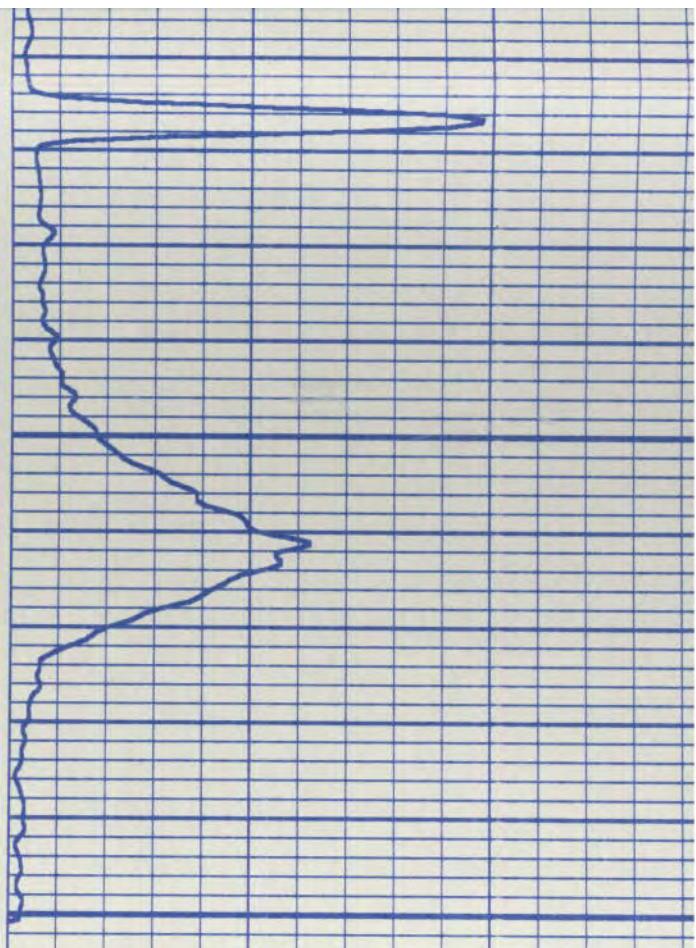


03200

CCL
0100

TDET (CPS)

0 500

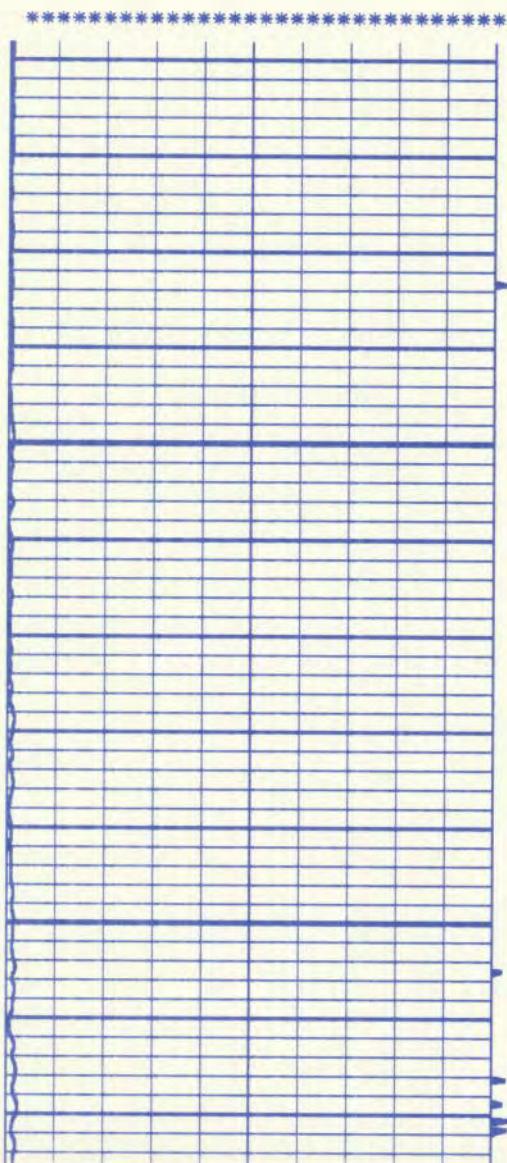


5000

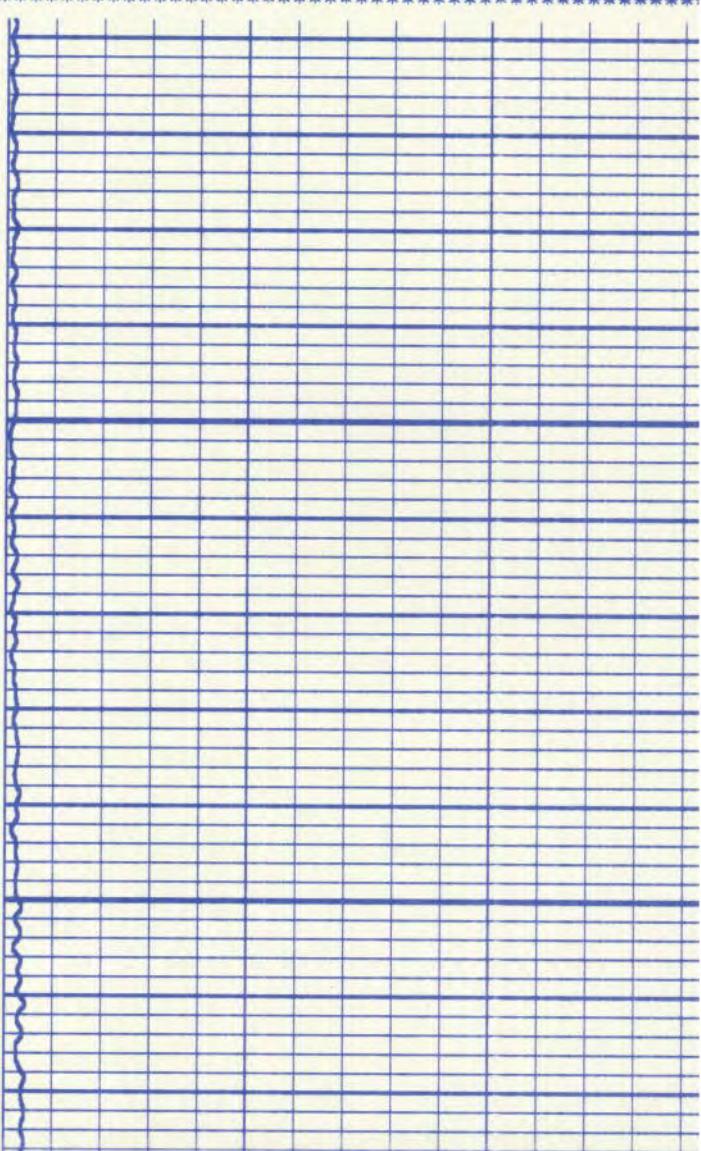
BDET (CPS)

0

FILE: 30



03000



TDET (CPS)

0

500

BDET (CPS)

0

500

FILE: 28

STATIONARY SHOTS TAKEN AT A
PUMP-IN RATE OF 50 GPM. DEPTH
WAS 3342 FT.

FILE: 39

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

SERVICE: F 150A

FILE: 39

DATE: 02/22/94

TIME: 19:45:58

REVISION: FSYS256 REV:0002 VER:2.0

MODE: RECORD

DEPTH: 3344

TDET (CPS)

0

500

BDET (CPS)

0

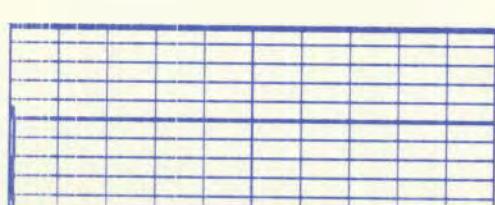
500

CCL

0100

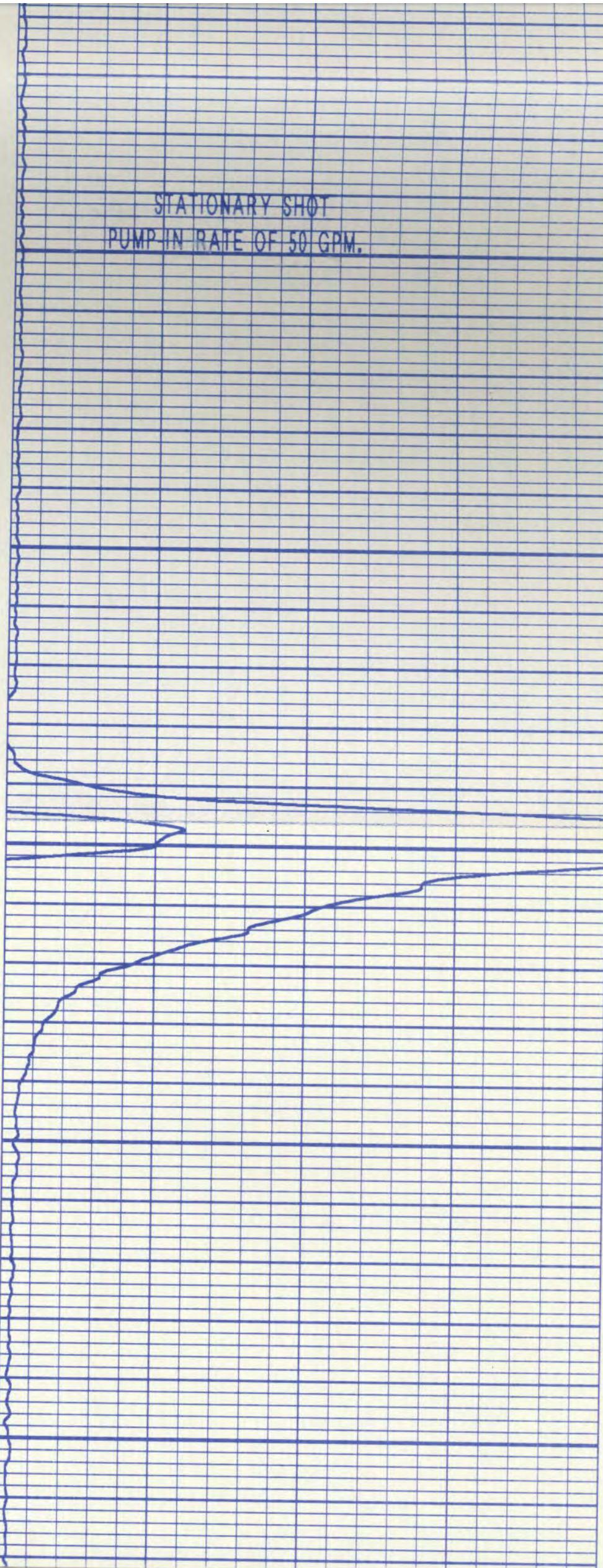
TEN (LBS)

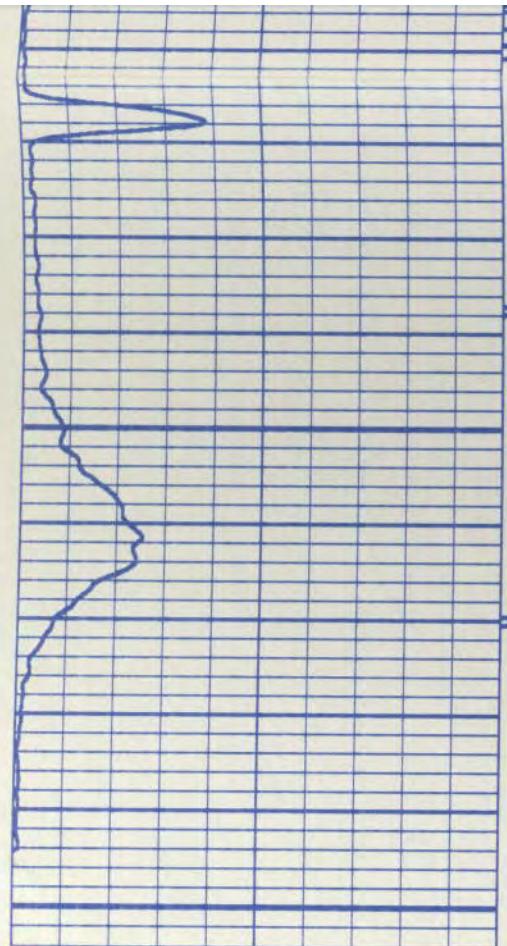
5000



STATIONARY SHOT
PUMP IN RATE OF 50 GPM.

00100
00200



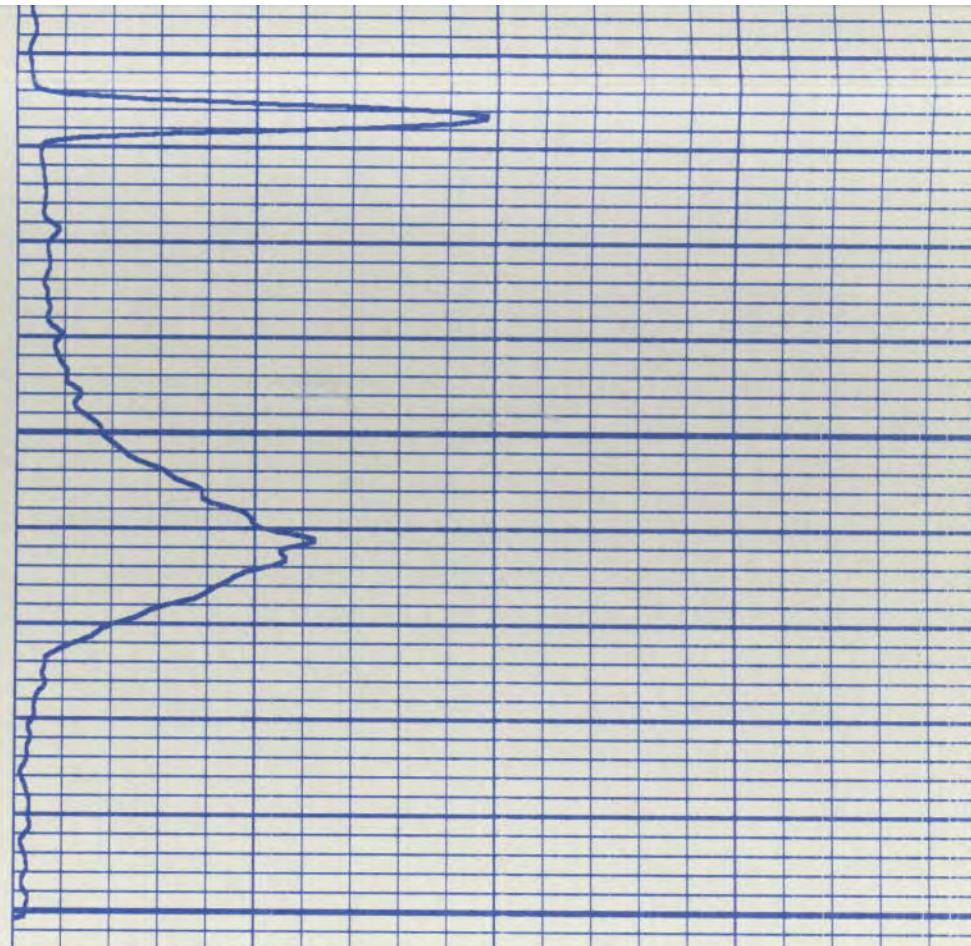


03200

CCL
0100

TDET (CPS)

0 500



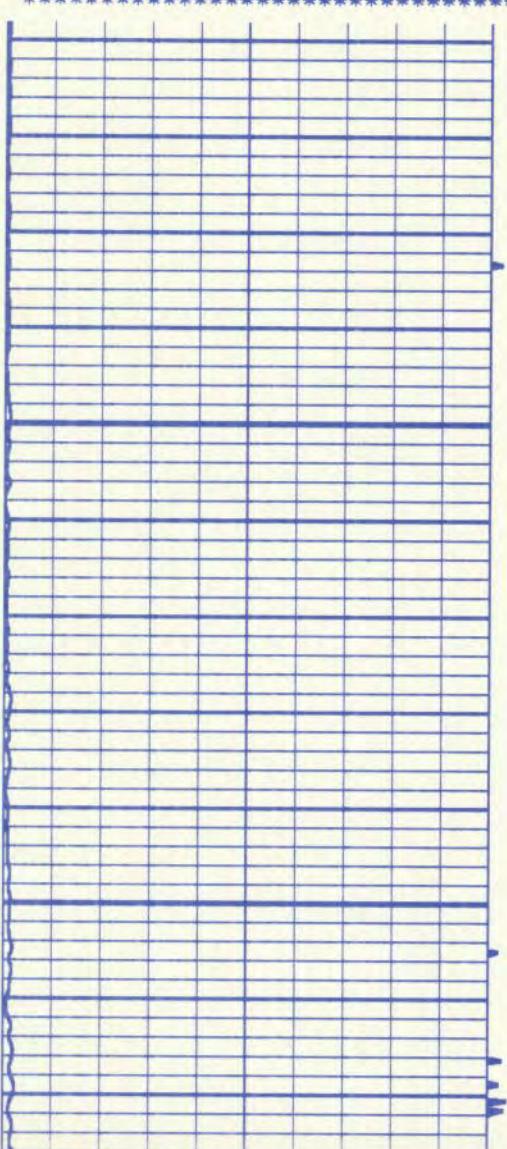
TEN (LBS)

5000

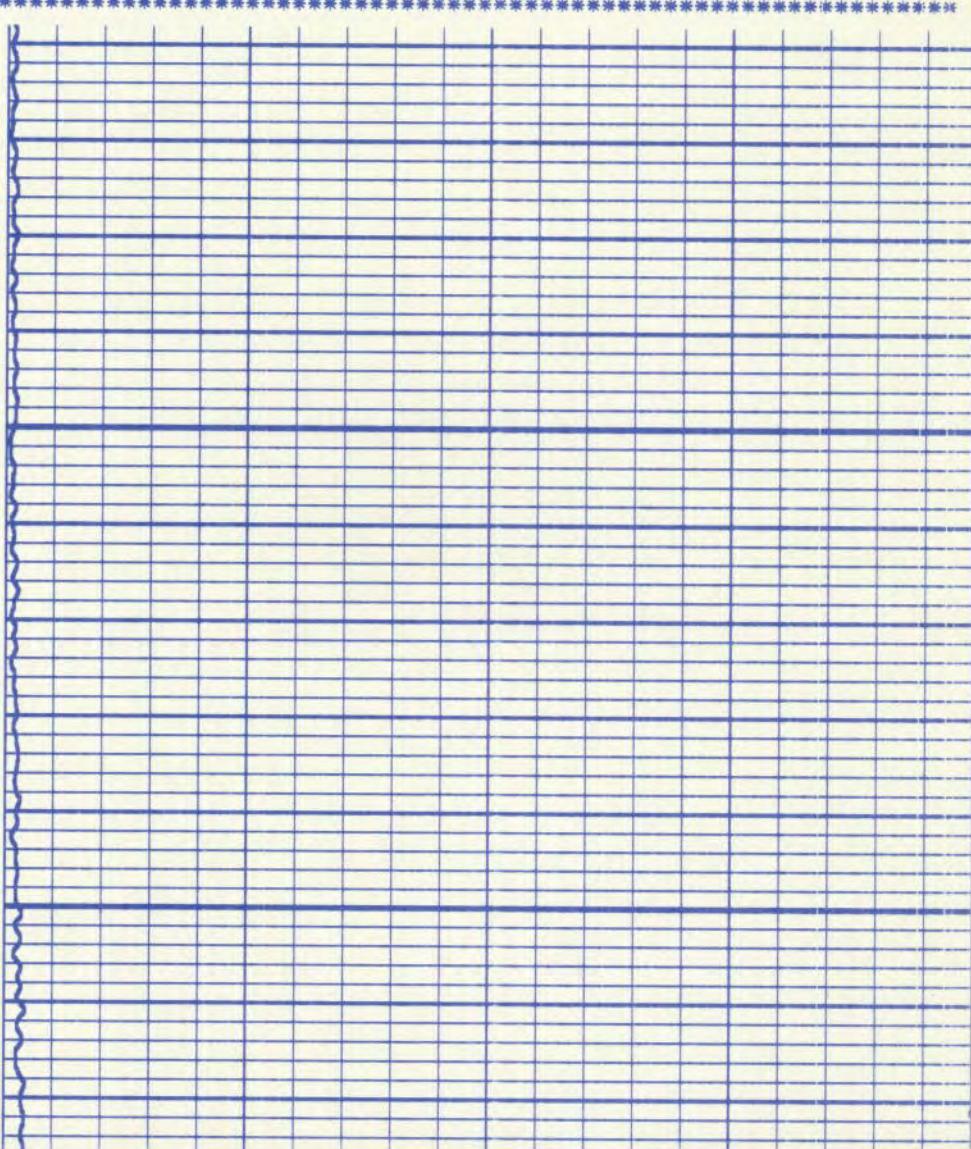
BDET (CPS)

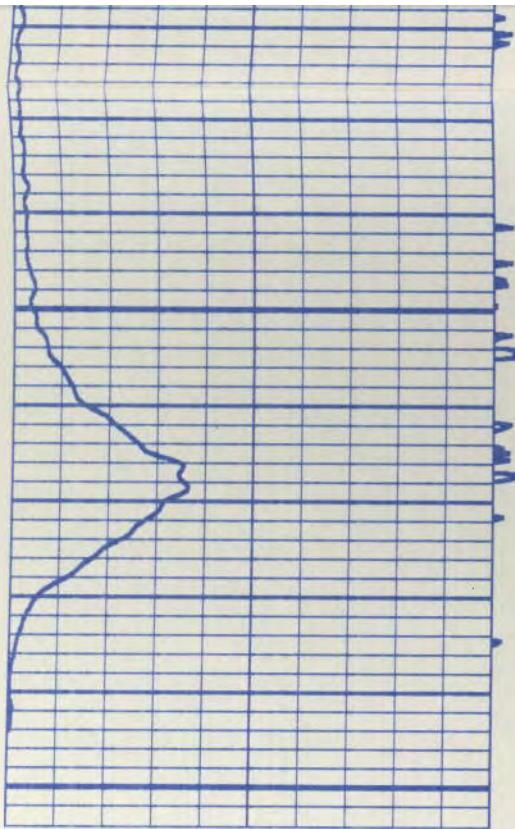
0 500

FILE: 30



03000



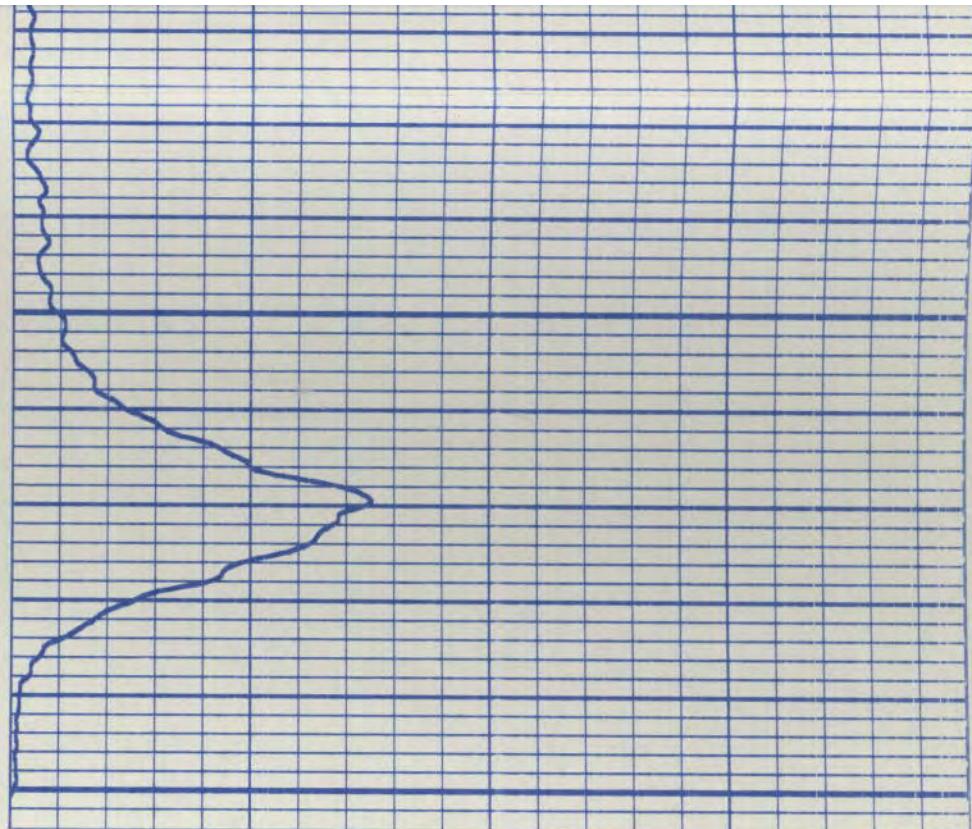


03100

CCL
0100

TDET (CPS)

0 500



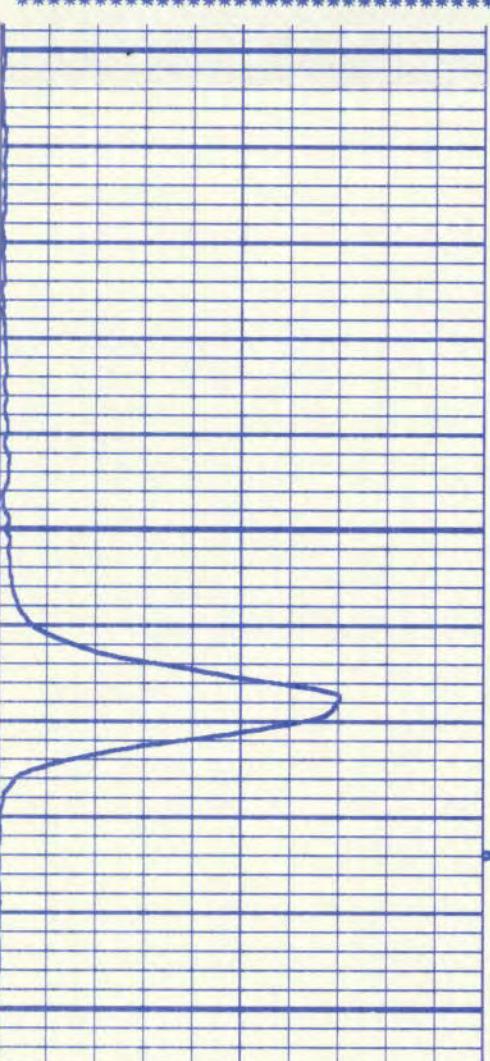
TEN (LBS)

5000

BDET (CPS)

0

FILE: 29

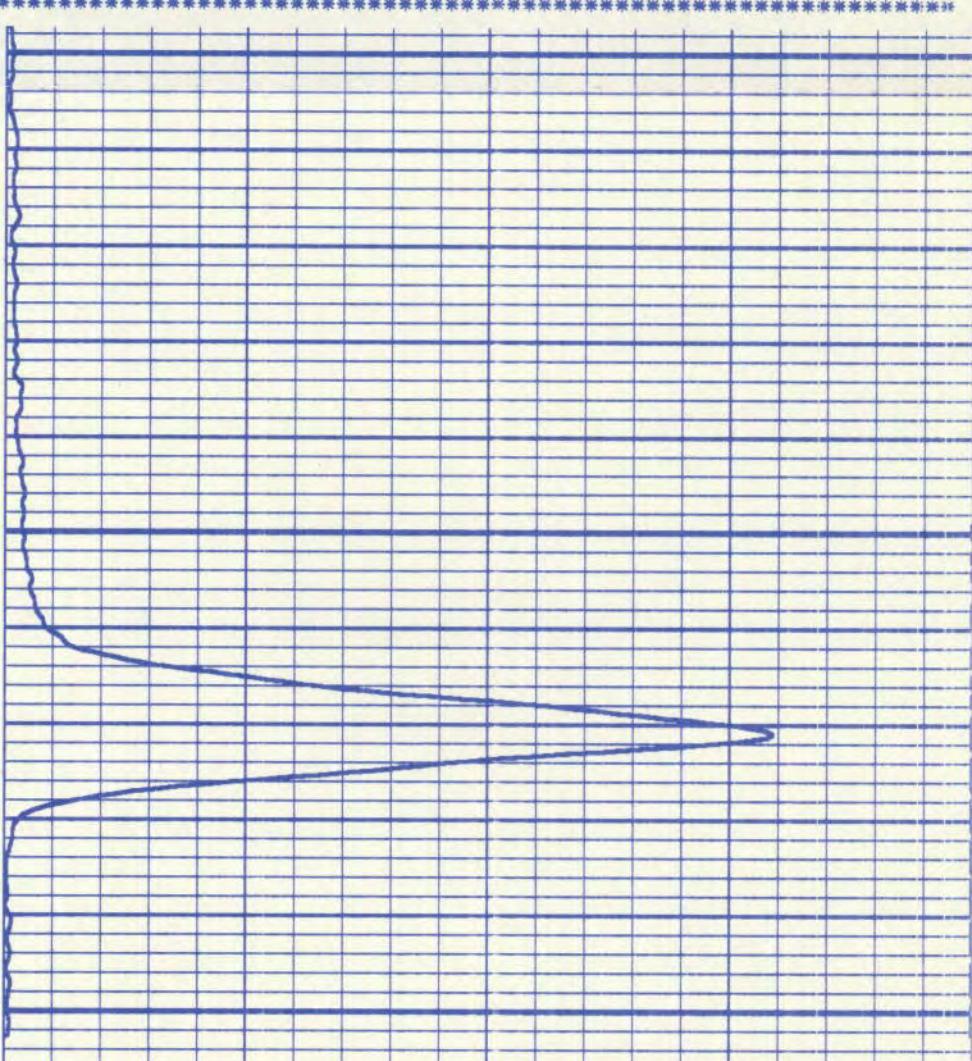


2900

CCL
0100

TDET (CPS)

500



TEN (LBS)

5000

BDET (CPS)

0

500

500

00800

00900

00010

FILE: 40

***** FILE: 40 *****

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

SERVICE: F 150A FILE: 40

DATE: 02/22/94

TIME: 20:04:03

REVISION: FSYS256 REV:Q002 VER:2.0

MODE: RECORD

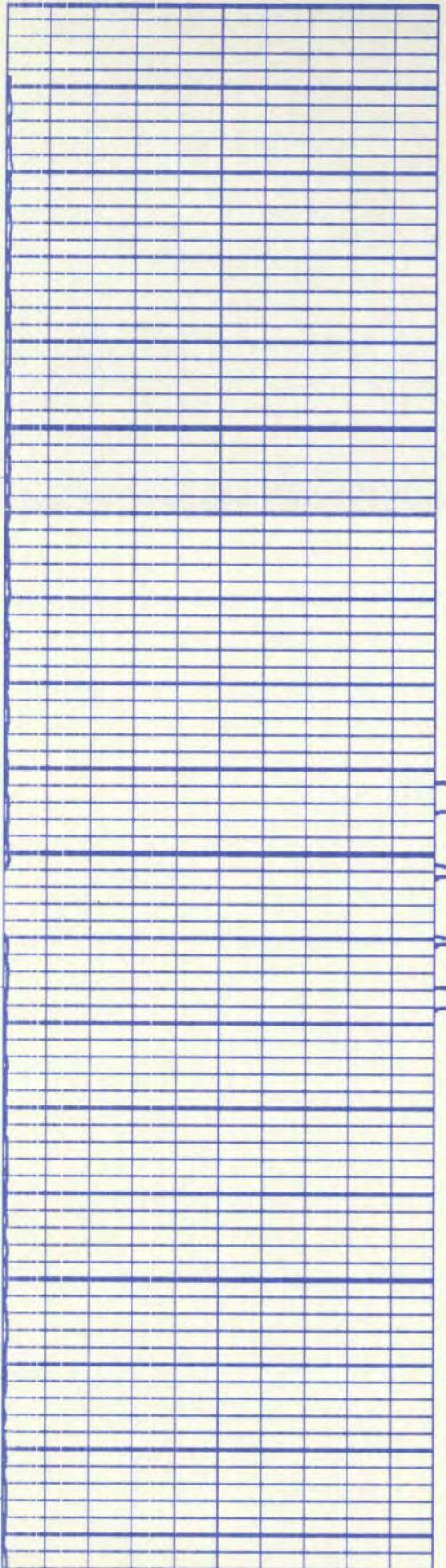
DEPTH: 3344

TDET (CPS)

0 500

CCL

0100



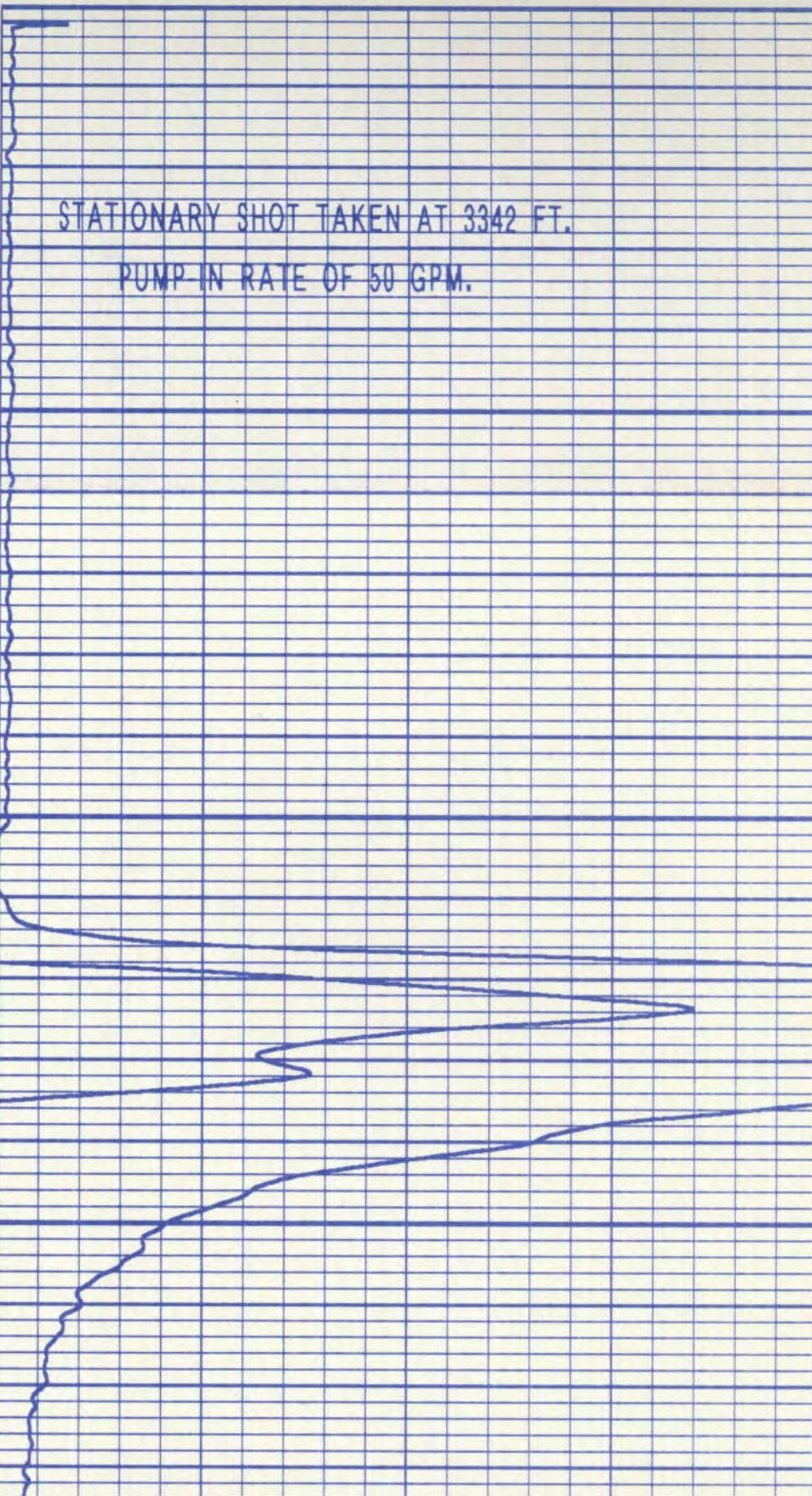
BDET (CPS)

0 500

TEN (LBS)

5000

0



00200

00300

00400

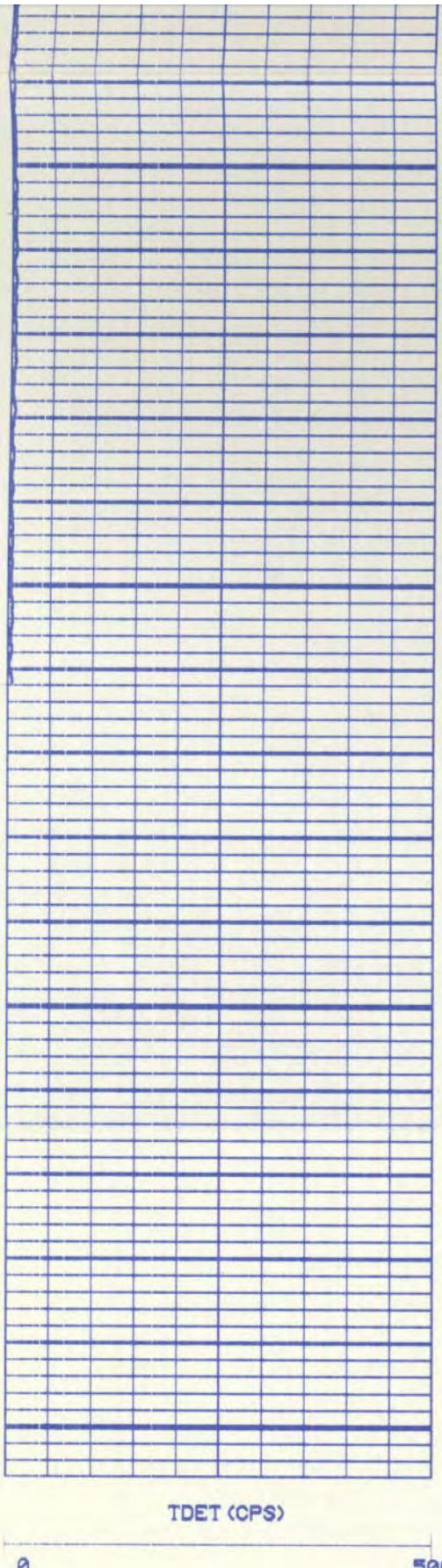
00500

00600

00700

00800

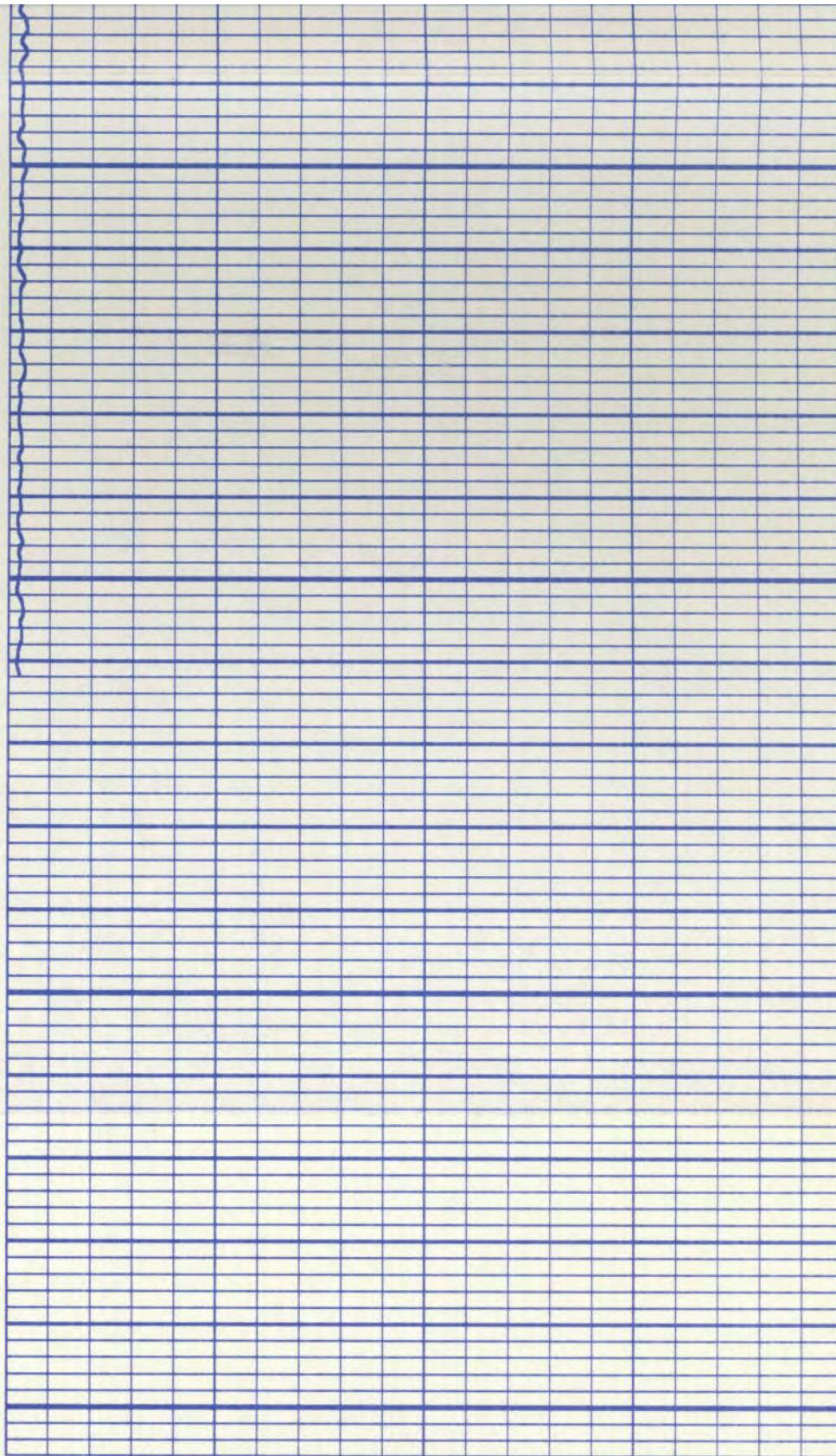
00900



TDET (CPS)

0 500

01000
01100
01110



BDET (CPS)

0 500

TEN (LBS)

5000 0

DISPLAY SCALE CHANGES

*** NONE ***

PARAMETERS

*** NONE ***

*** NONE ***

FILE: 40

***** FILE: 48 *****

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
TDET	6,6	FT, IN
BDET	0	FT, IN
CCL	16,0	FT, IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

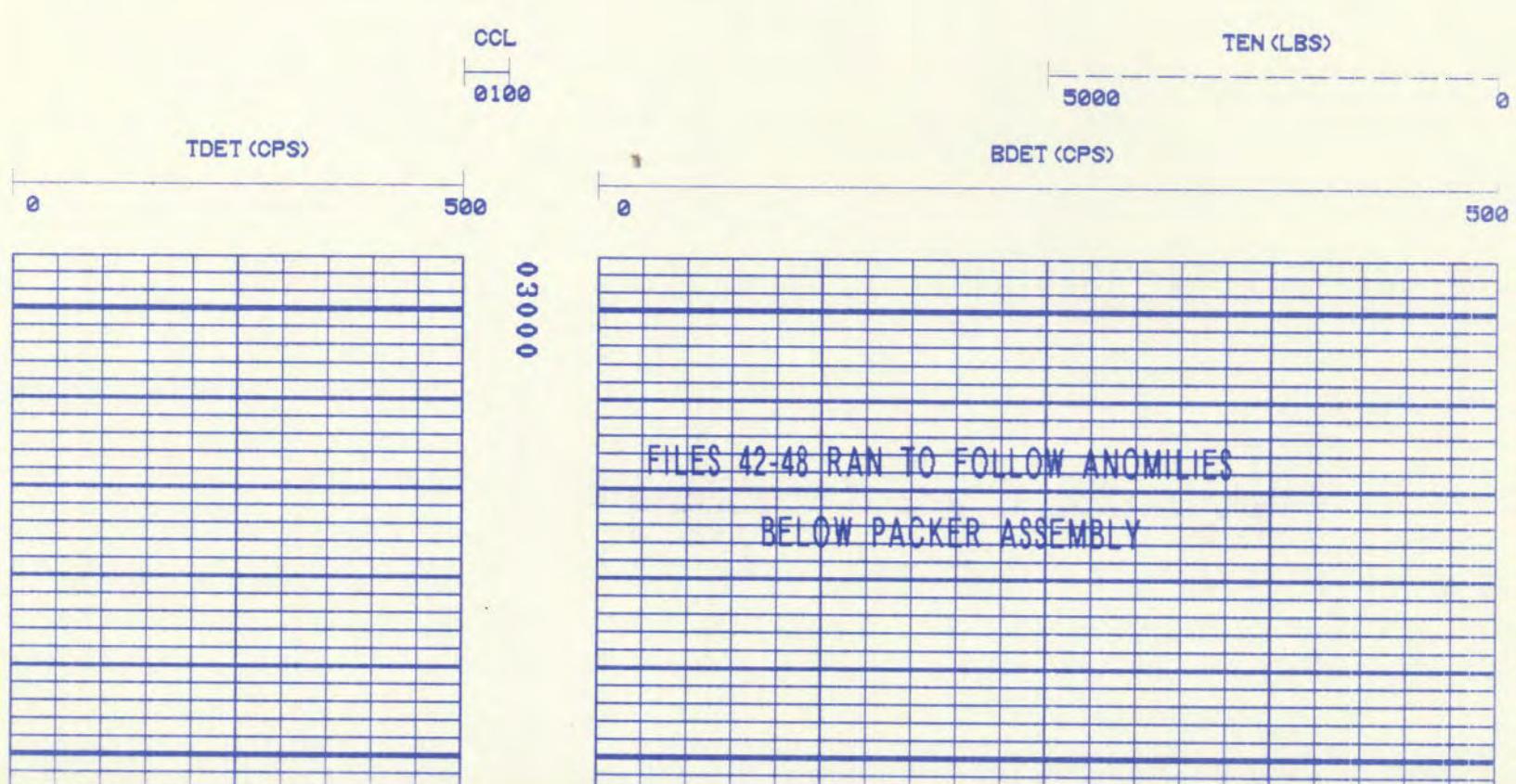
SERVICE: F 150A FILE: 48

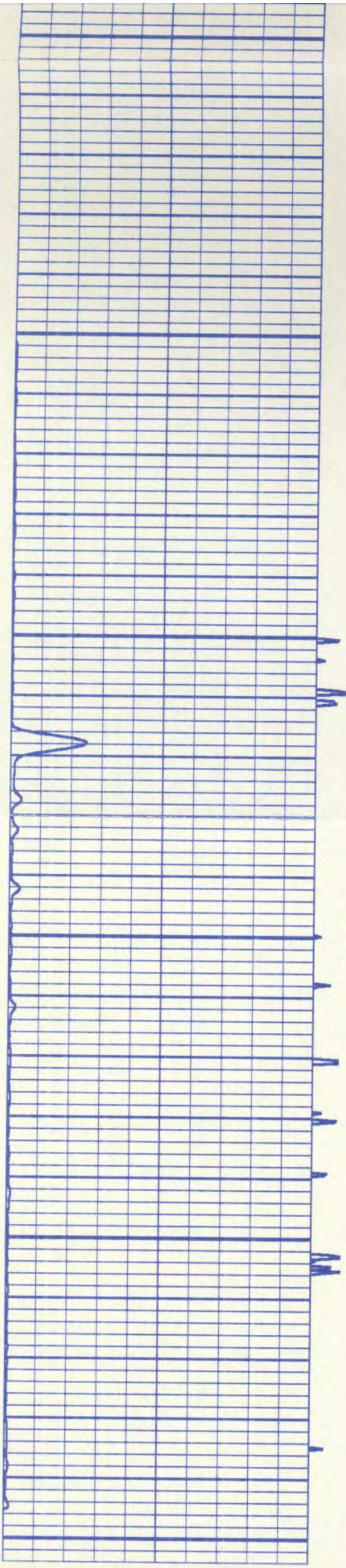
DATE: 02/22/94

TIME: 21:17:57

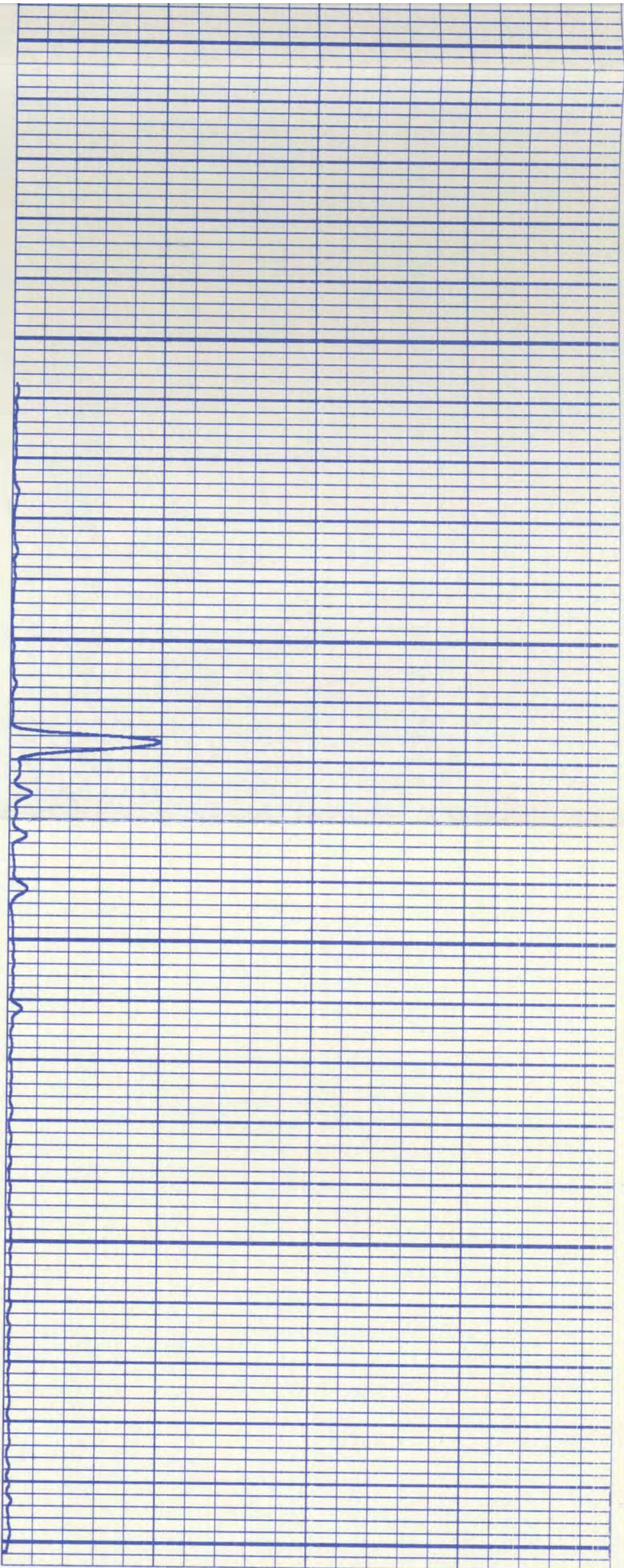
REVISION: FSYS256 REV:G002 VER:2.0

MODE: RECORD

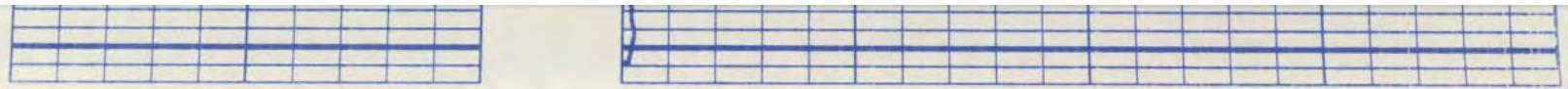




03100



03200



CCL

0100

TEN (LBS)

5000

0

TDET (CPS)

0

500

BDET (CPS)

0

500

FILE: 48

FILE: 47

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
TDET	6,6	FT,IN
BDET	0	FT,IN
CCL	16,0	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

SERVICE: F 150A FILE: 47

DATE: 02/22/94

TIME: 21:10:35

REVISION: FSYS256 REV:G002 VER:2.0

MODE: RECORD

CCL

0100

TEN (LBS)

5000

0

TDET (CPS)

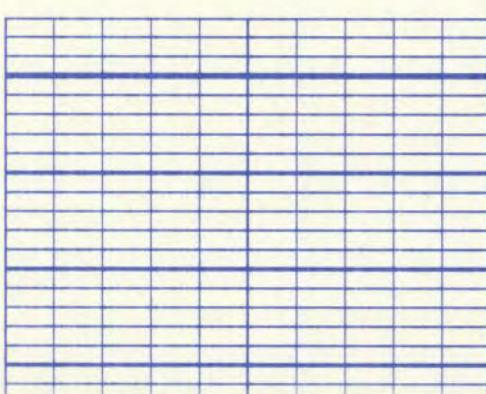
0

500

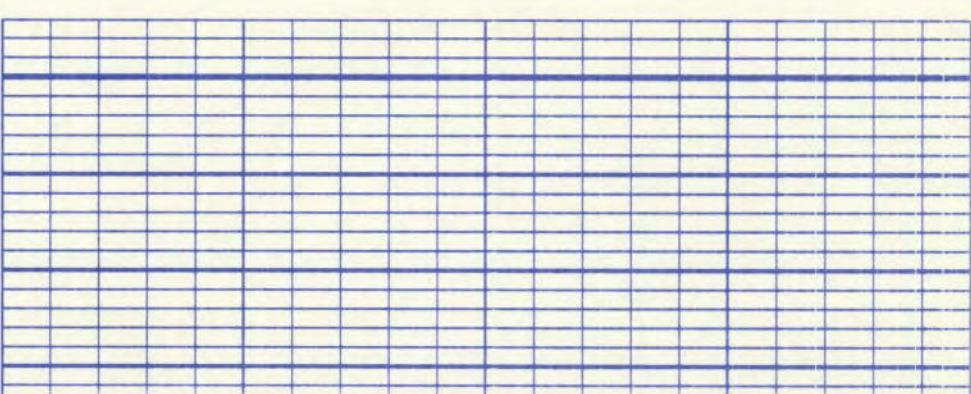
BDET (CPS)

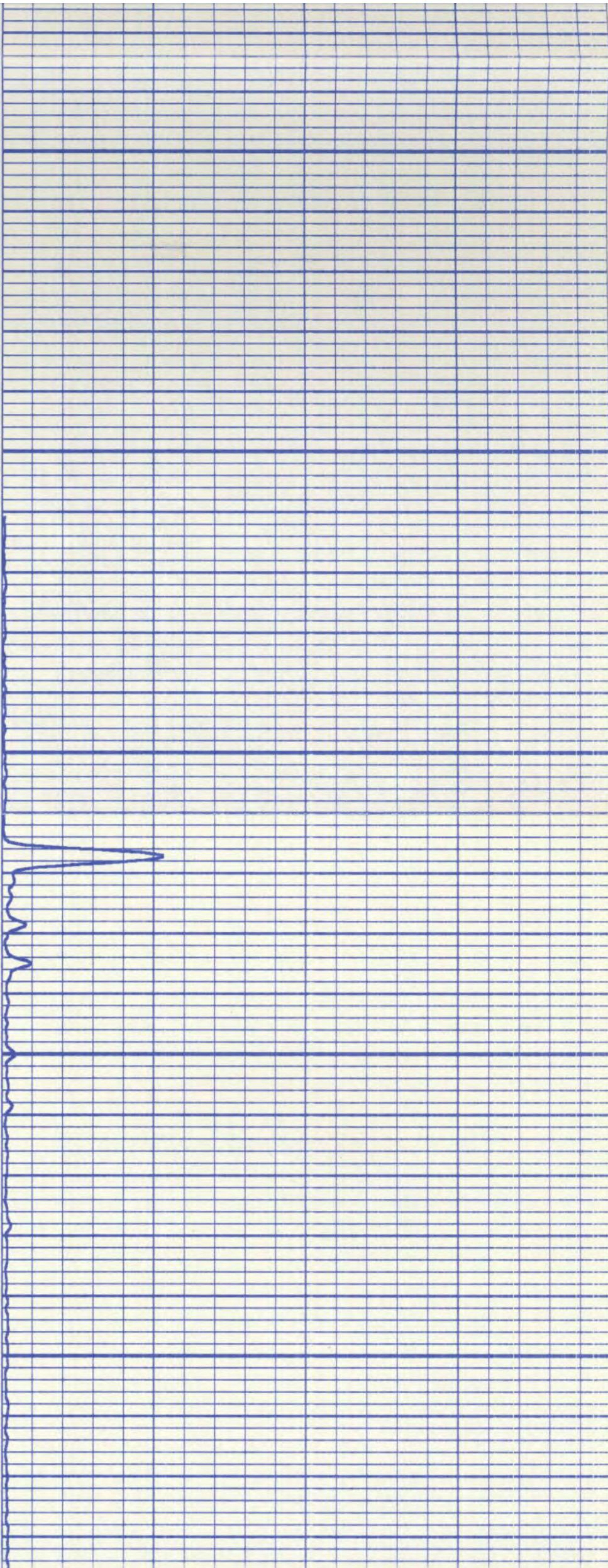
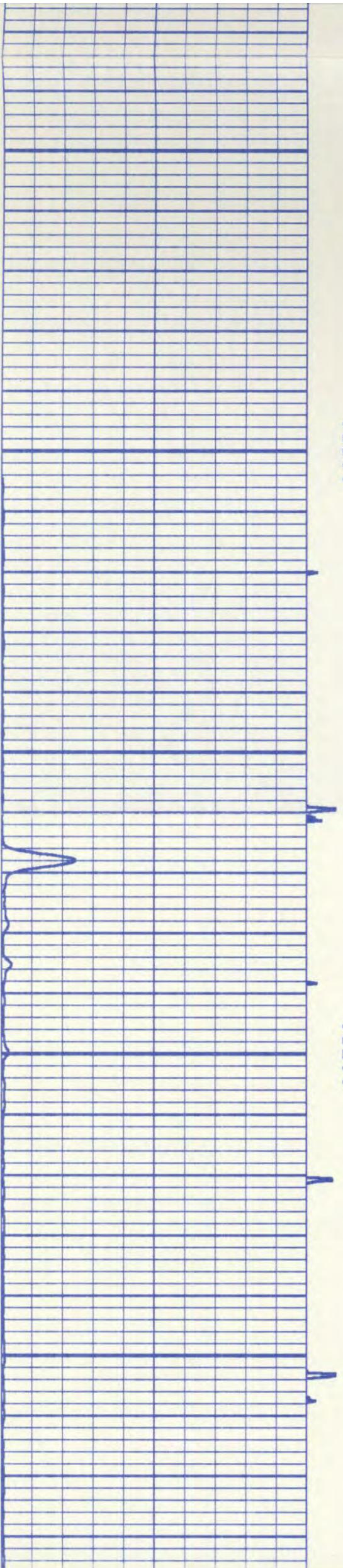
0

500



03000





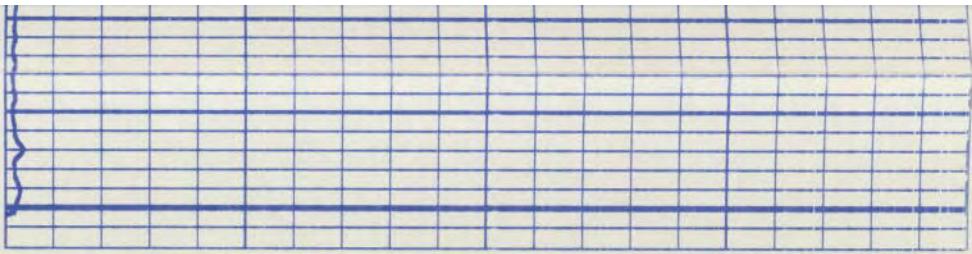
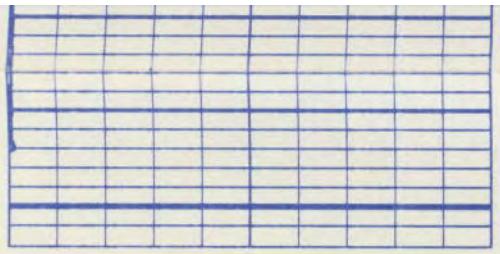
00300

00400

00500

00600

00700



CCL
0100

TEN (LBS)

5000

0

TDET (CPS)

0 500

BDET (CPS)

0 500

FILE: 47

FILE: 46

CURVE DELAY REPORT

CURVE	PHYS.	DELAY	UNITS
TDET	FT, IN	6,6	
BDET	FT, IN	0	
CCL	FT, IN	16,0	

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

SERVICE: F 150A FILE: 46

DATE: 02/22/94

TIME: 21:03:59

REVISION: FSYS256 REV:G002 VER:2.0

MODE: RECORD

CCL
0100

TEN (LBS)

5000

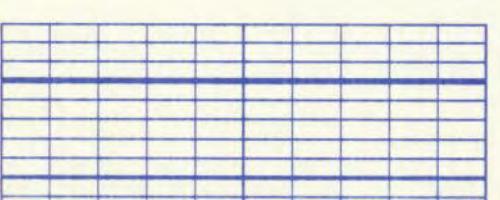
0

TDET (CPS)

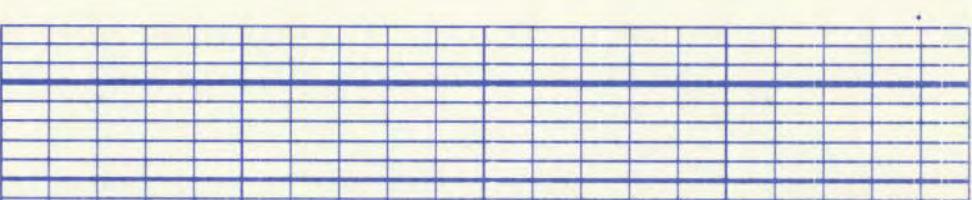
0 500

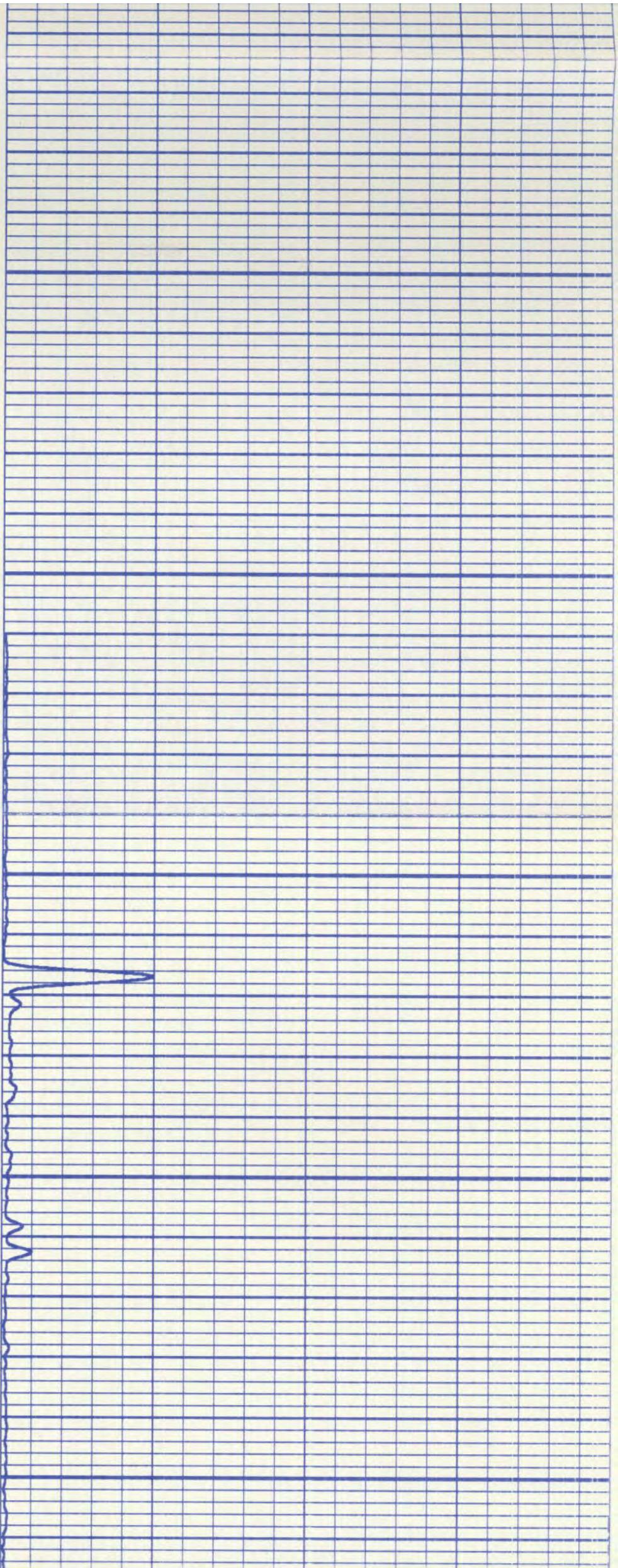
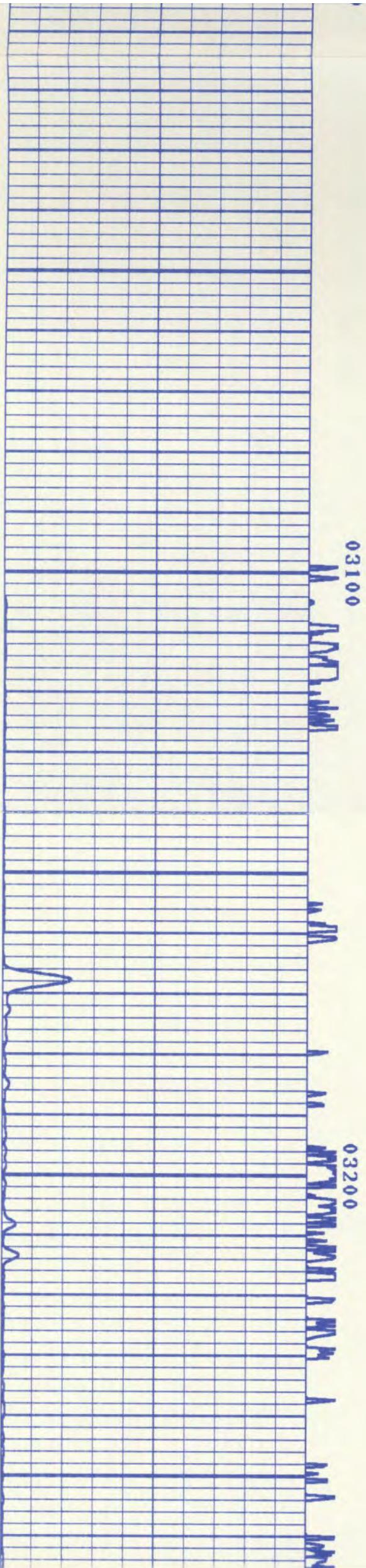
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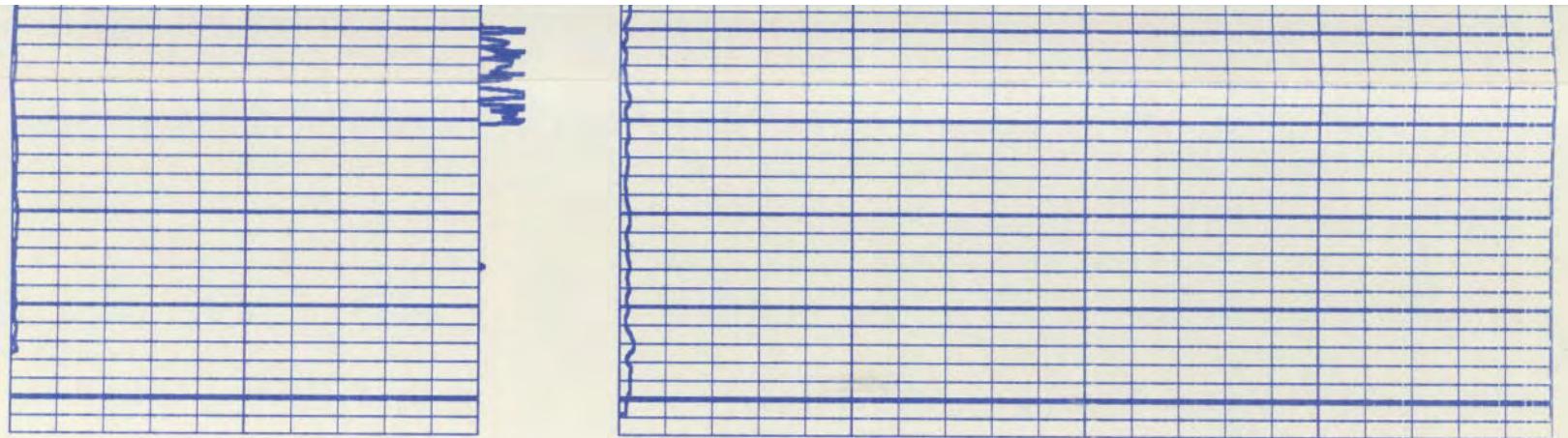
500



03000







CCL
0100

TEN (LBS)

5000

0

TDET (CPS)

0 500

0 500

FILE: 46

FILE: 45

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
TDET	6,6	FT,IN
BDET	0	FT,IN
CCL	16,0	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

SERVICE: F 150A FILE: 45

DATE: 02/22/94

TIME: 20:53:58

REVISION: FSYS256 REV:G002 UER:2.0

MODE: RECORD

CCL
0100

TEN (LBS)

5000

0

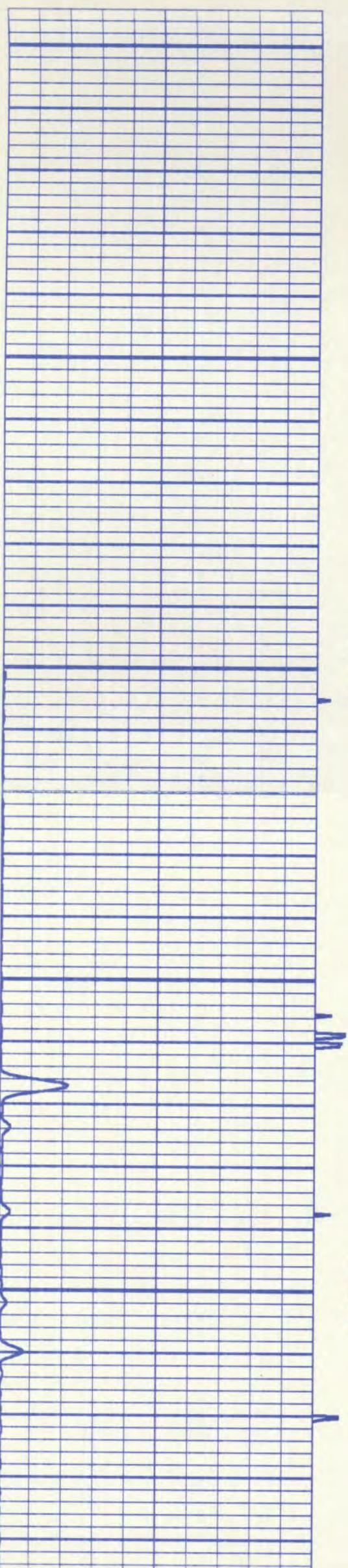
TDET (CPS)

0 500

0 500

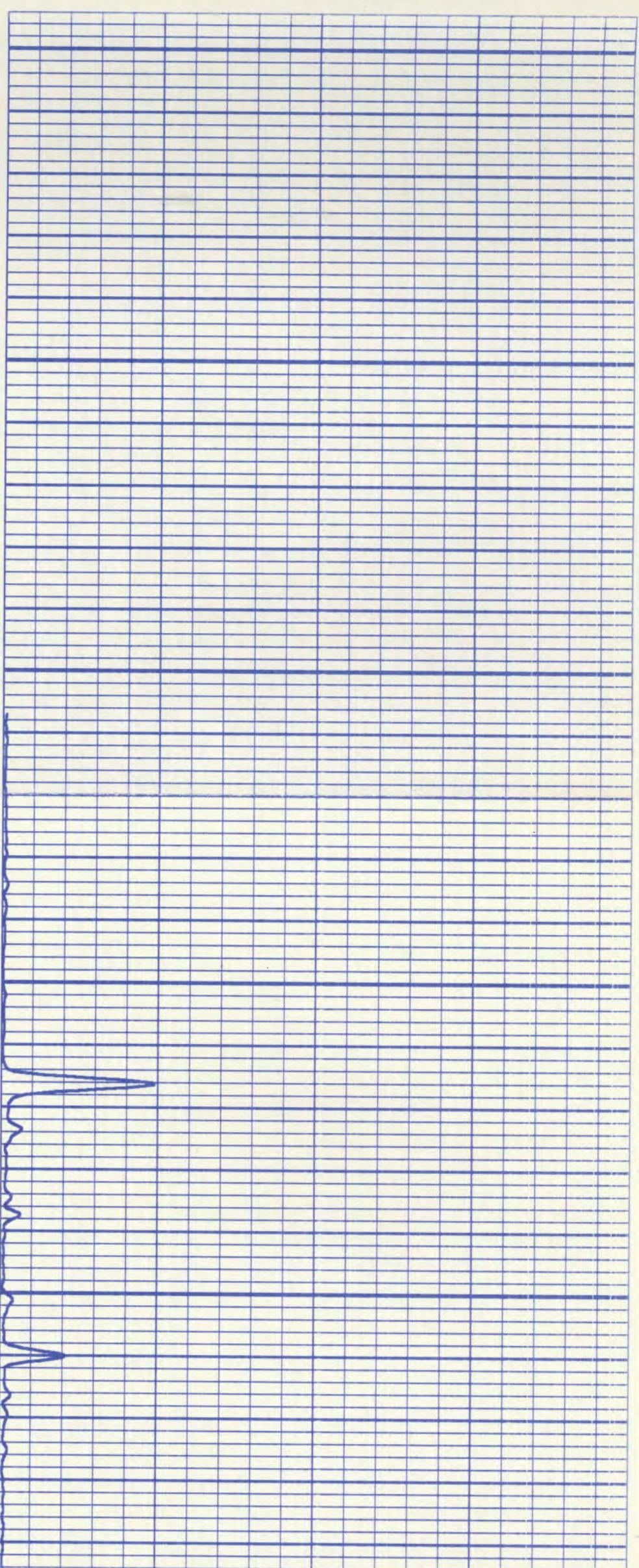
BDET (CPS)

0 500



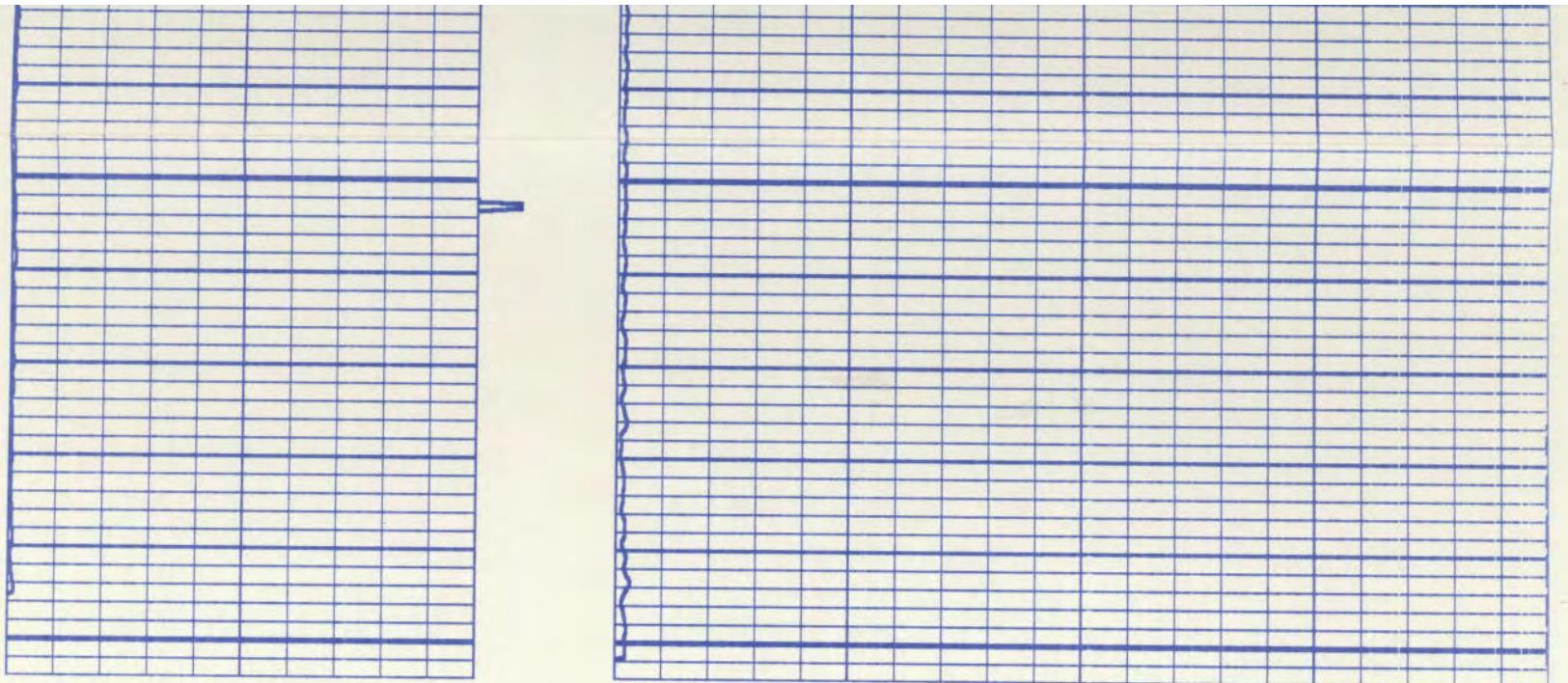
03000

0 500



03100

03200



CCL
0100

TEN (LBS)
5000 0

TDET (CPS)
0 500

BDET (CPS)
0 500

FILE: 45

FILE: 44

CURVE DELAY REPORT

PHYS.		
CURVE	DELAY	UNITS
-----	-----	-----
TDET	6,6	FT, IN
BDET	0	FT, IN
CCL	16,0	FT, IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

SERVICE: F 150A FILE: 44

DATE: 02/22/94

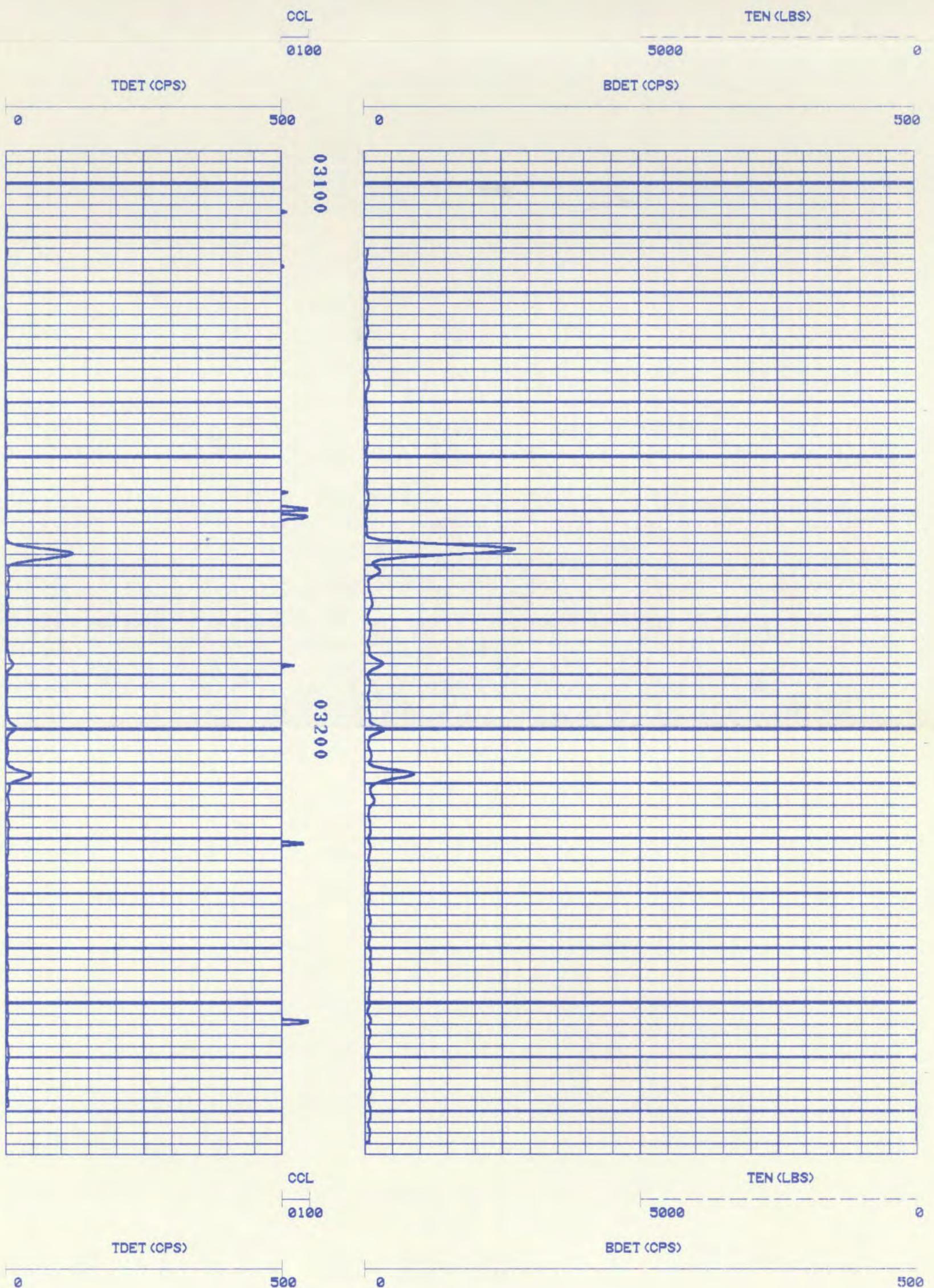
TIME: 20:48:52

REVISION: FSYS256 REV:Q002 VER:2.0

MODE: RECORD

CCL

TEN (LBS)



FILE: 44

***** FILE: 43

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
TDET	6,6	FT, IN
BDET	0	FT, IN
CCL	16,0	FT, IN

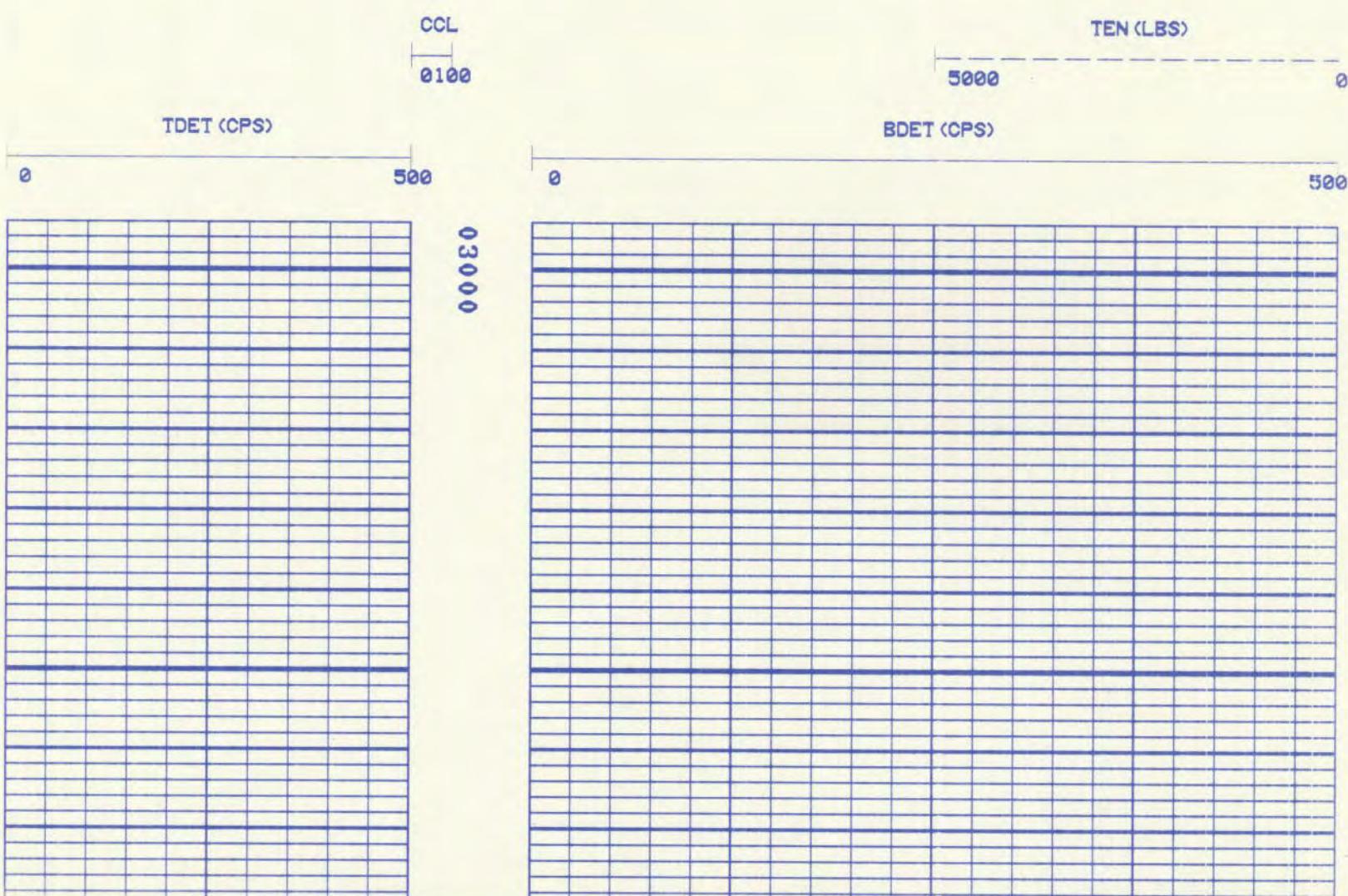
PARAMETERS

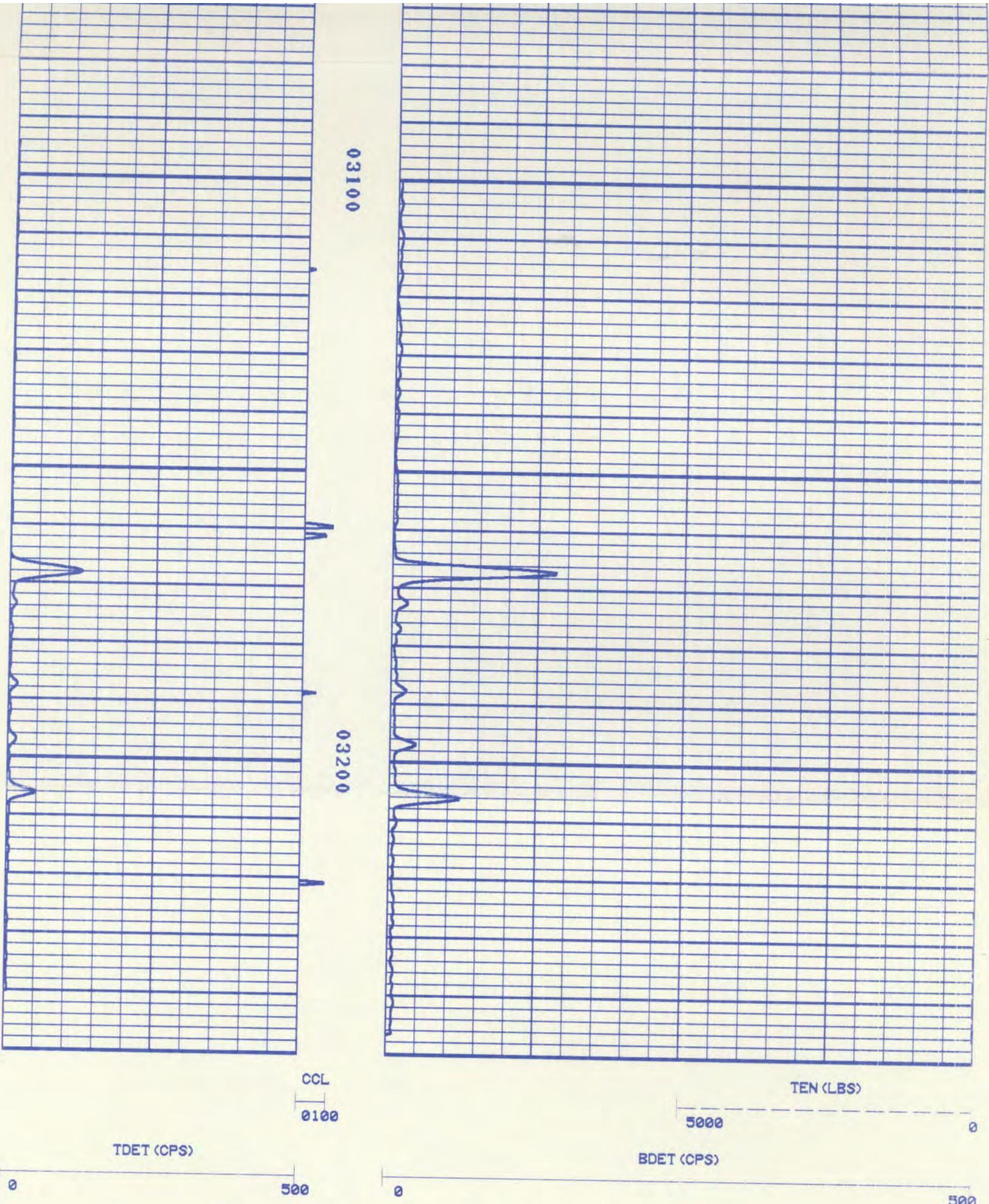
*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC. RUN: 1
WELL NAME: NO. 2 WELL - WDW 14 TRIP: 1
SERVICE: F 150A FILE: 43 DATE: 02/22/94 TIME: 20:42:48
REVISION: FSYS256 REV:G002 VER:2.0 MODE: RECORD





FILE: 43

FILE: 42

CURVE DELAY REPORT

PHYS.
CURVE DELAY UNITS

CURVE	DELM1	UNITS
TDET	6,6	FT,IN
BDET	0	FT,IN
CCL	16,0	FT,IN

PARAMETERS

**** NONE ***

DISPLAY SCALE CHANGES

**** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

SERVICE: F 150A FILE: 42

DATE: 02/22/94

TIME: 20:37:15

REVISION: FSYS256 REV:G002 VER:2.0

MODE: RECORD

CCL
0100

TEN (LBS)

5000

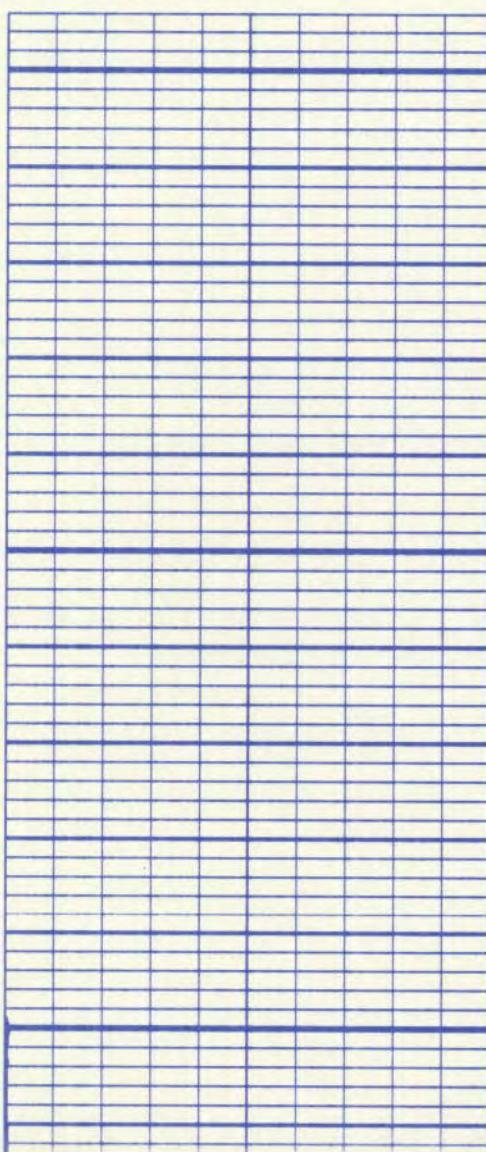
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TDET (CPS)

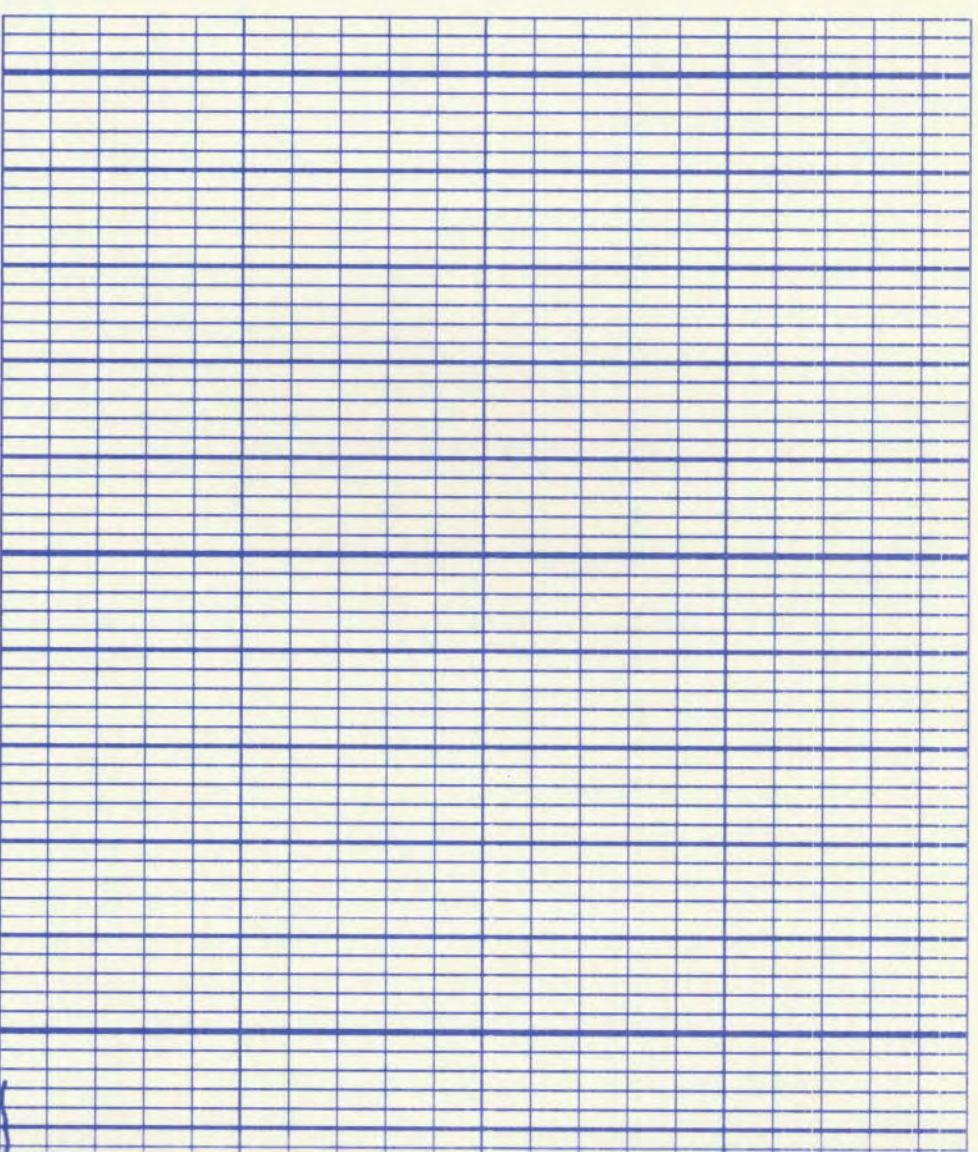
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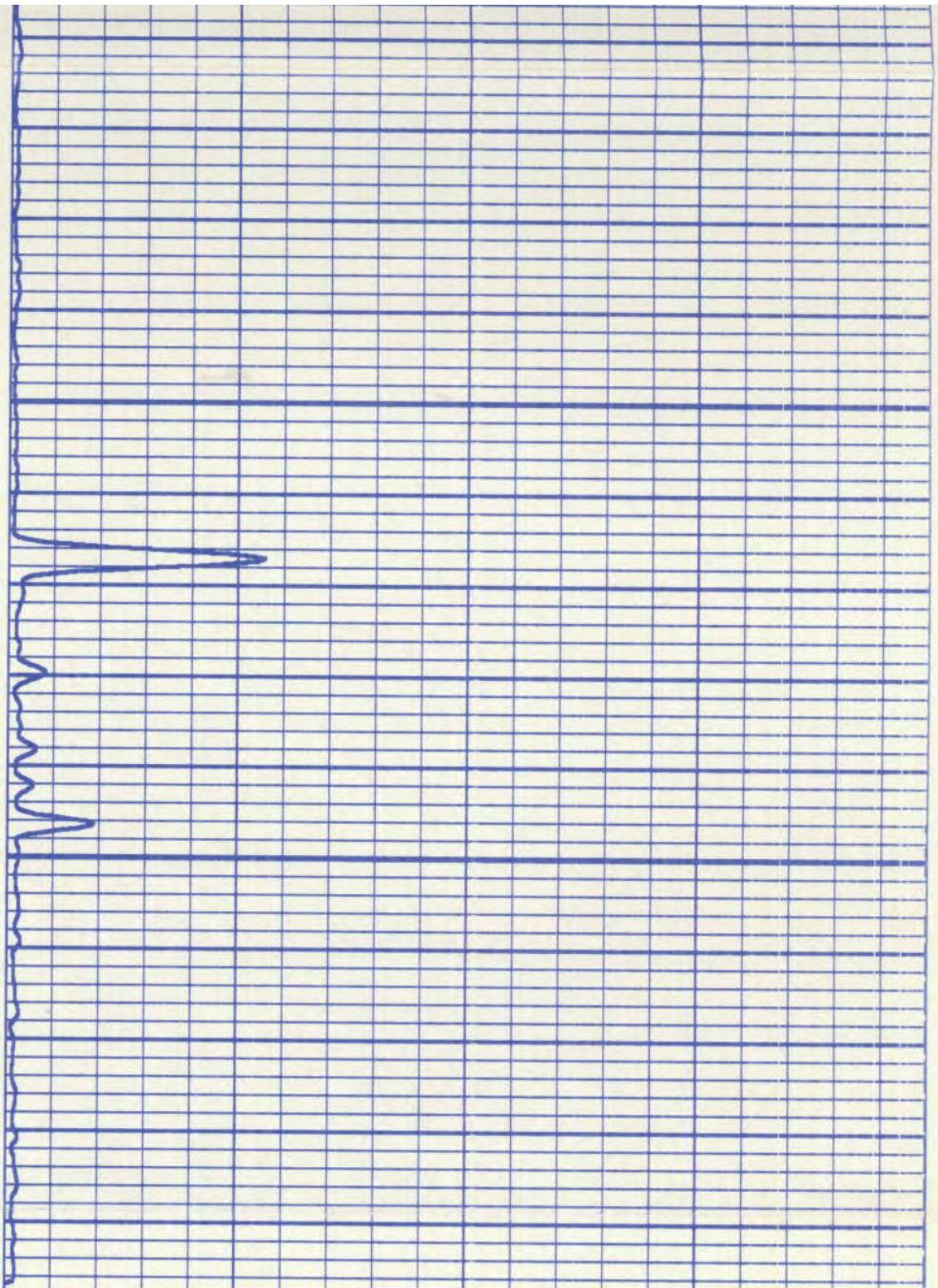
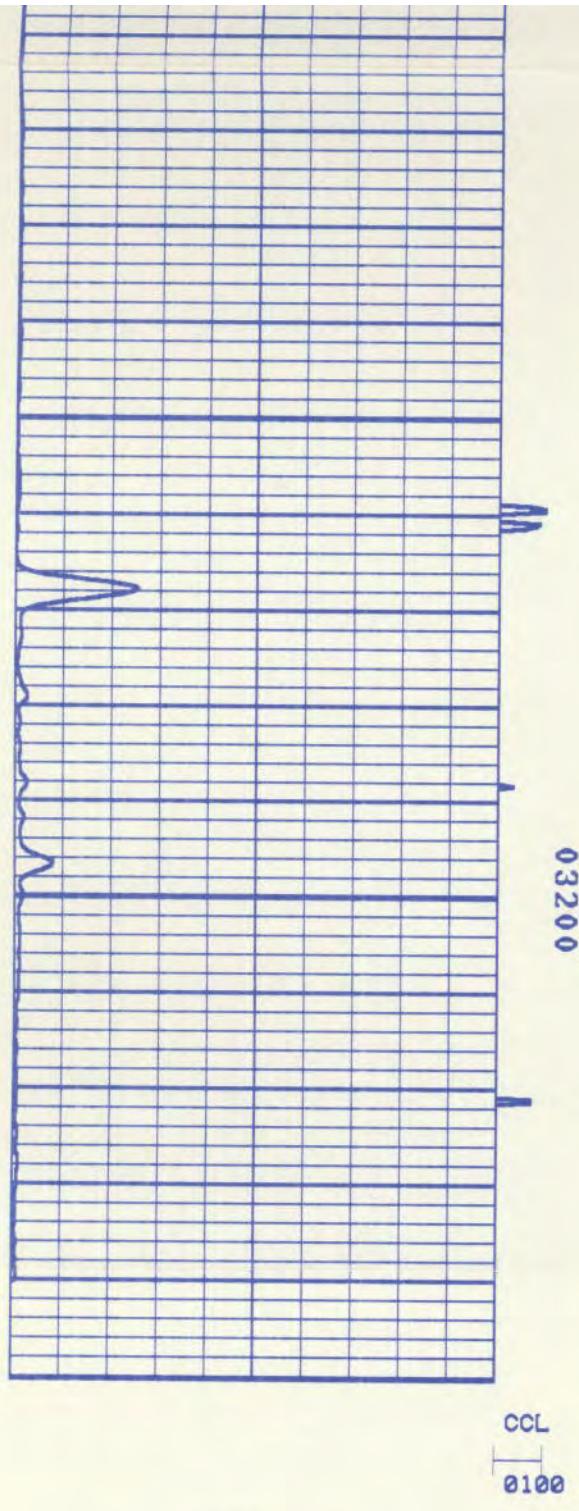
BDET (CPS)

0 500



03000
0100





CCL
0100

TDET (CPS)

0 500

FILE: 42

TEN (1 RS)

5000

2

500

FILE: 41

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
TDET	6,6	FT,IN
BDET	0	FT,IN
CCL	16,0	FT,IN

PARAMETERS

*** NONE ***

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: NO. 2 WELL - WDW 14

TRIP: 1

SERVICE: F 150A FILE: 41

DATE: 02/22/94

TIME: 20:23:40

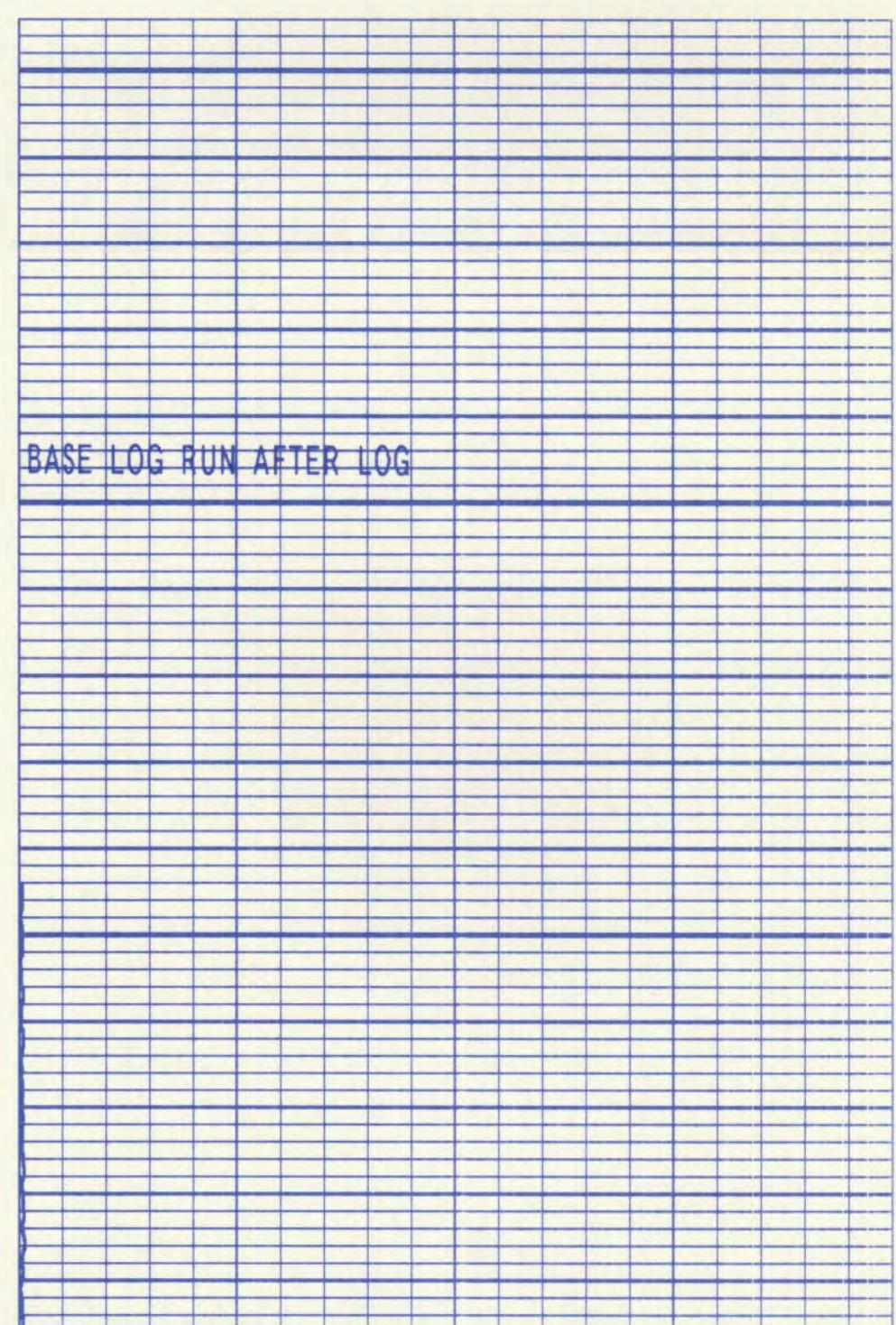
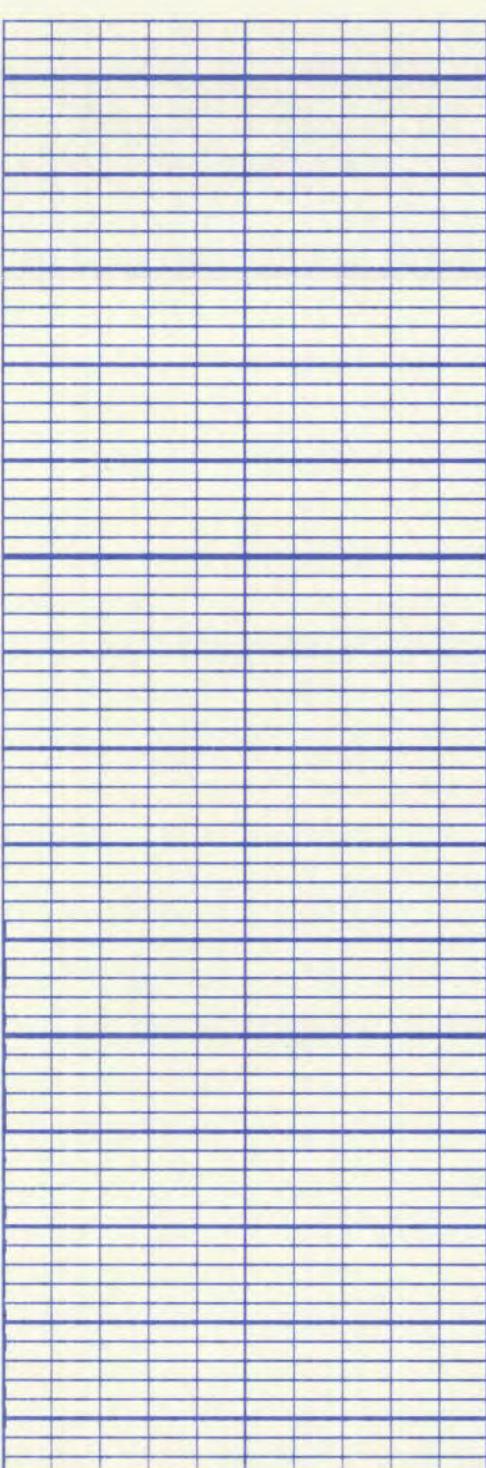
REVISION: FSYS256 REV:G002 VER:2.0

MODE: RECORD

CCL
0100

TEN (LBS)

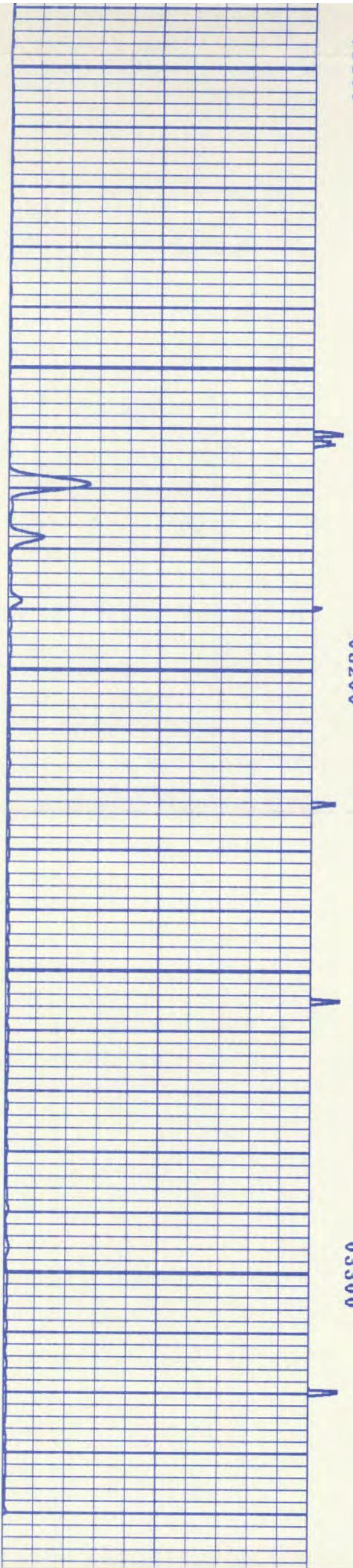
5000

TDET (CPS)
0 500BDET (CPS)
0 500

02900

03000

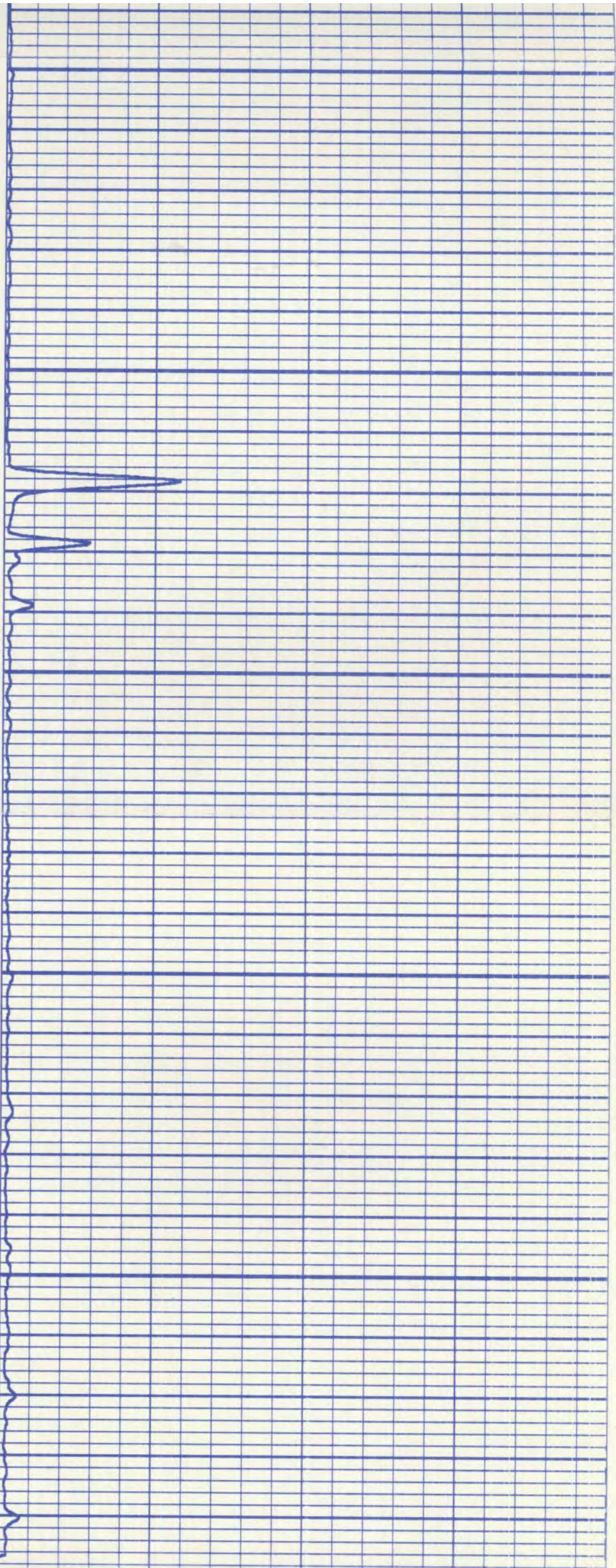
03



03100

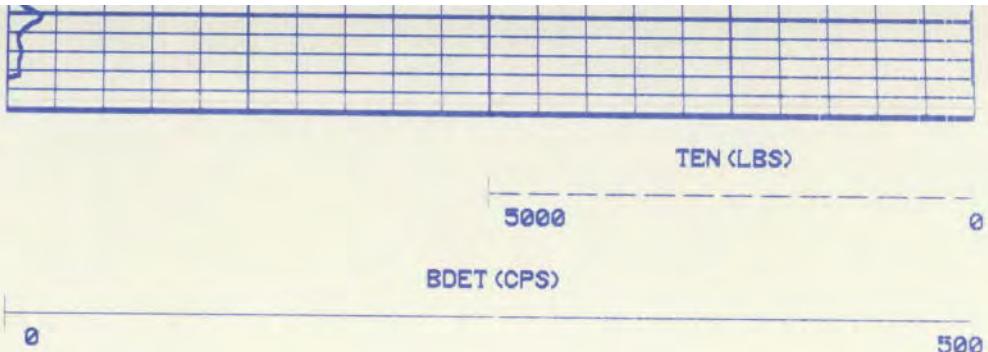
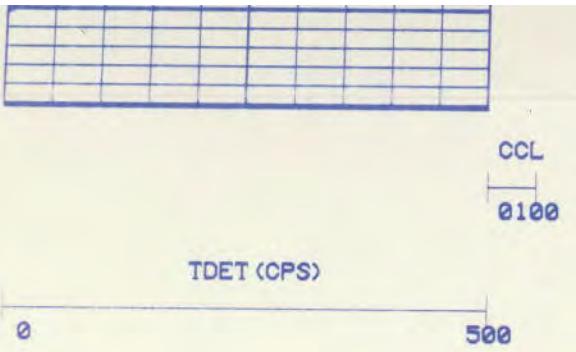
03200

03300



03200

03300



FILE: 41

GR TIE-IN LOG

GAMMA RAY LOG (API)

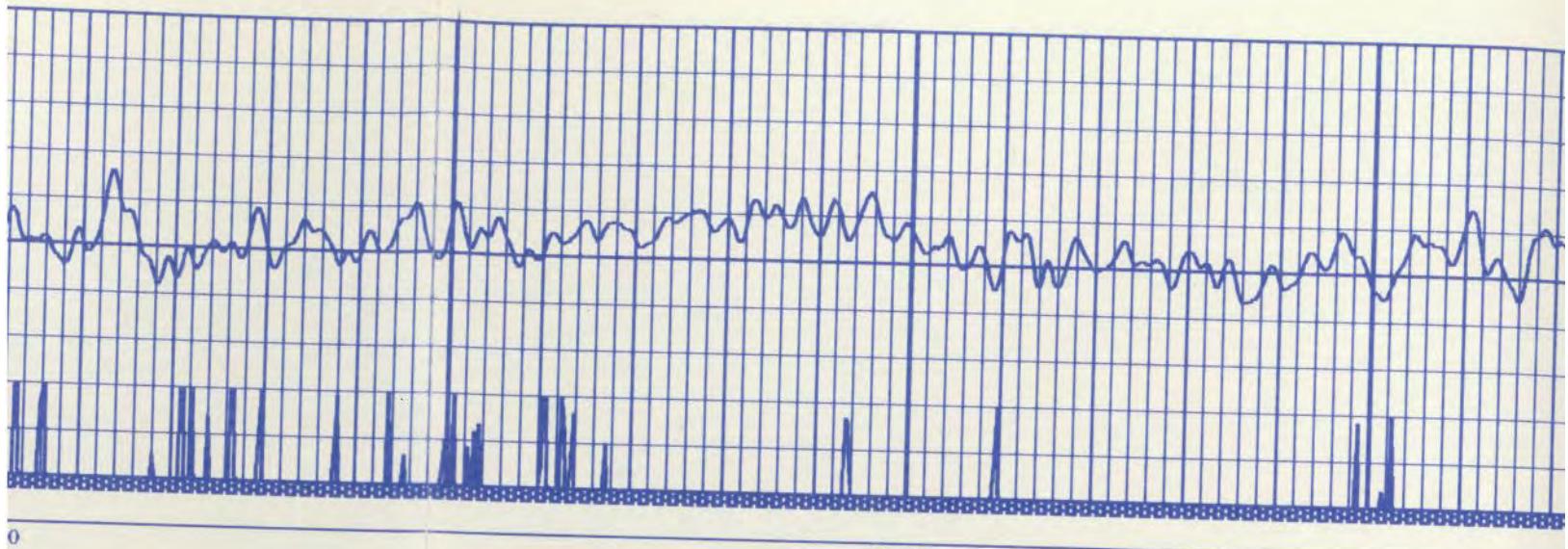
0 80
CCL
50 0

02

GAMMA RAY LOG (API)

0 80
 CCL
50 0

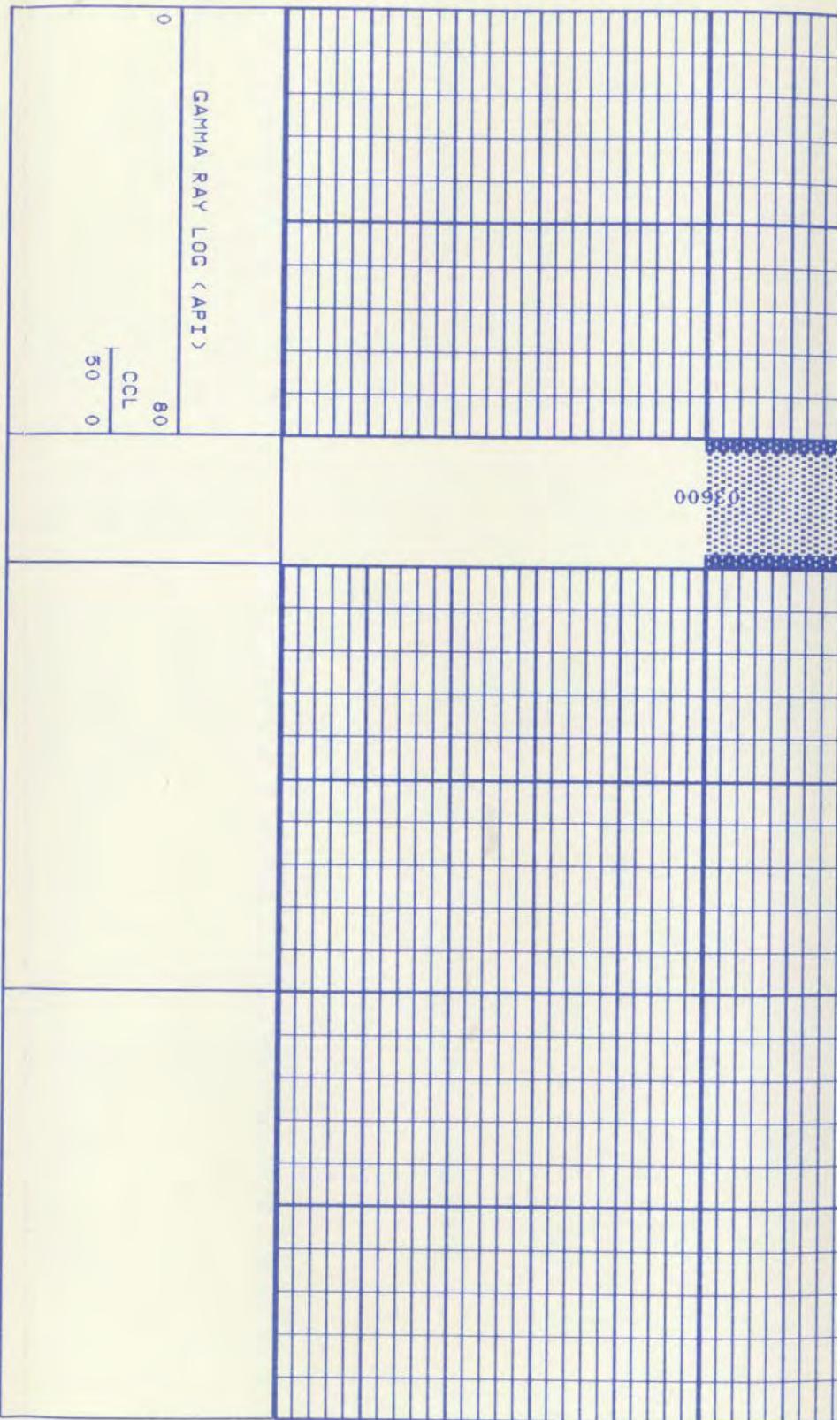
02800

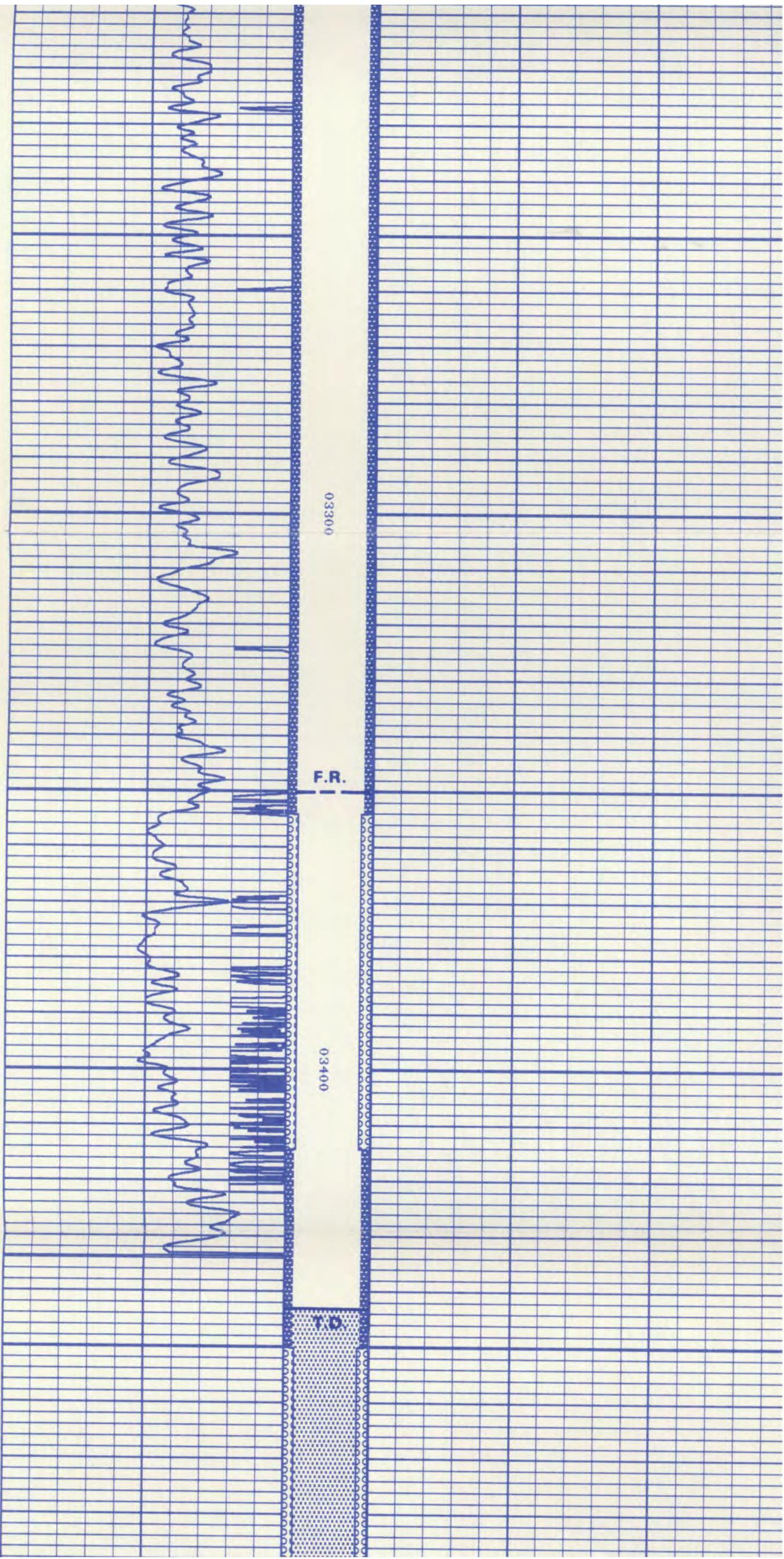


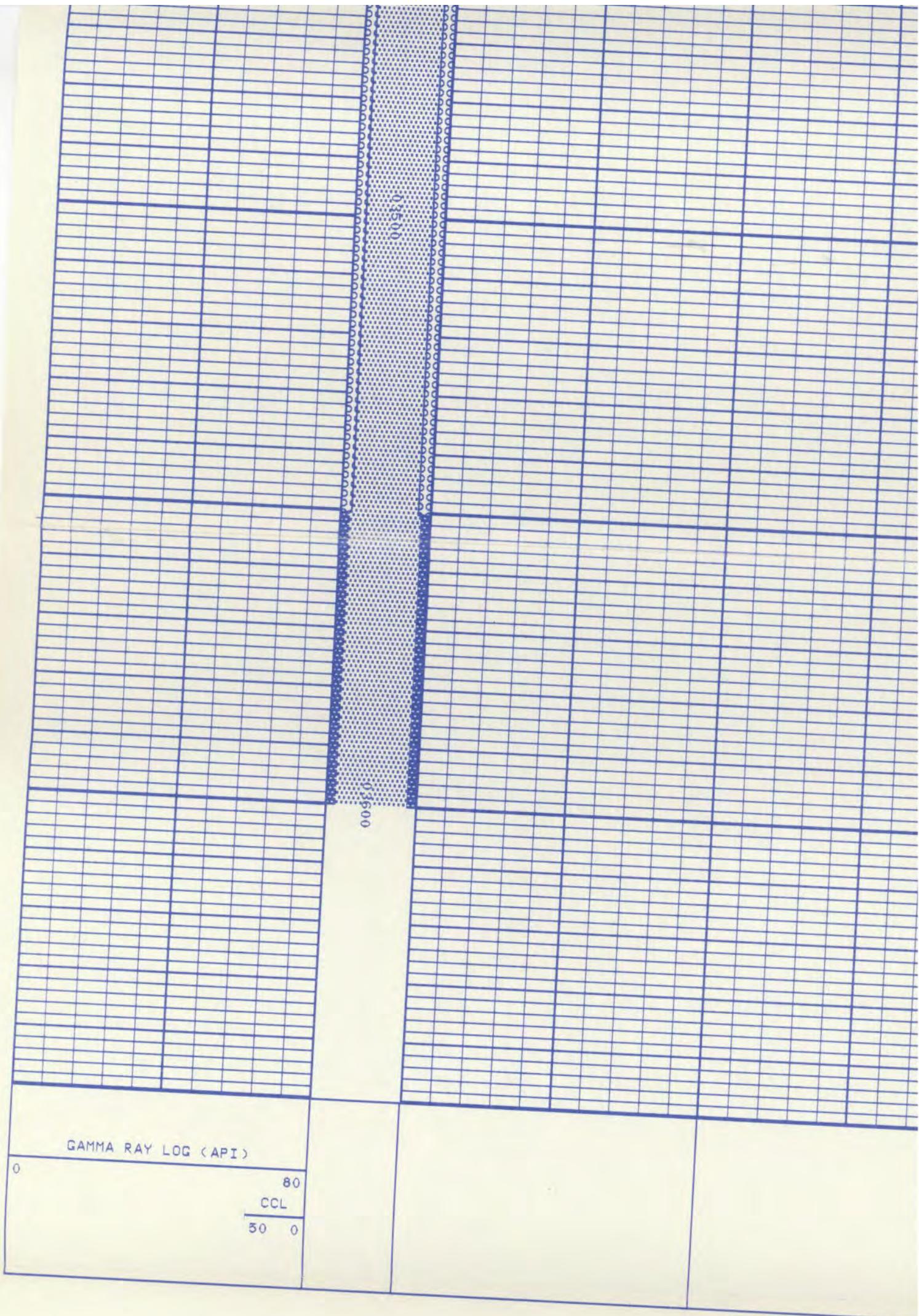
0

03000









**ECO Solutions, Inc.
Hoechst Celanese Chemical Group, Inc.
Pressure Falloff/MIT Testing**

APPENDIX G

DIFFERENTIAL TEMPERATURE LOG AND ATLAS WIRELINE SERVICES INTERPRETATION LETTER

DIAGNOSTIC DIFFERENTIAL TEMPERATURE LOG

**Hoechst Celanese Corporation
Well No. 2 - WDW #14
Bay City Plant
Matagorda County, Texas**

**Prepared for
ECO Solutions, Inc.
Houston, Texas**

**ATLAS WIRELINE SERVICES
WESTERN ATLAS INTERNATIONAL**

February 22, 1994

Prepared by Freeman Hill, III

DISCLAIMER

In making interpretations of logs, our employees will give Customer the benefit of their best judgement, but since all interpretations are opinions based on inferences from electrical or other measurements, we cannot, and we do not guarantee the accuracy or the correctness of any interpretation. We shall not be liable or responsible for any loss, cost, damages, or expenses whatsoever incurred or sustained by the Customer resulting from any interpretation made/by any of our employees.



ATLAS WIRELINE SERVICES

Disposal Well Background

The Hoechst Celanese Chemical Company , Inc.'s Injection Well No. 2 - WDW #14, located at the Bay City facility has been used for underground injection for the past 26 years. in addition to surface and intermediate casing strings, the well contains a string of 9 5/8 inch OD casing cemented to 3650 ft and 5.5 inch tubing and packer assembly, located at 3165 ft. Waste fluids have been injected into a perforated injection interval located below 3354 ft at rates of approximately 185 - 190 GPM.

A logging program consisting of a Radioactive Tracer ejector and detector instrument and a Differential Temperature Tool was used to evaluate the integrity of the casing and cement and to verify that the injection interval had accepted the disposed fluids.

The well was shut-in for 48 hours prior to initiating the logging program to provide a static, geothermal temperature profile. The following will list each step of the Differential Temperature logging program, its purpose and a discussion of the log's analysis.

Logging Program and Analysis

Differential Temperature Log (February 21, 1994)

1. Logged temperature instrument from surface to 3442 ft
Purpose: Static temperature gradient.

Analysis: Since uniform gradients are uncommon near surface due to fluctuating surface temperatures and changing lithologies with varying thermal diffusivities and conductivities, the irregularities found above 800 ft should be ignored.

Below this depth, a fairly straight temperature gradient of approximately .004°F/ft is observed to 1600 ft. From 1600 ft to 3100 ft, a gradient of .006°F/ft exists. Some minor anomalies are noted; however, they can be attributed to varying lithologies. It is important to remember that due to the nature of shale (e.g., no permeability, compacted, little water content), the temperature recovery is retarded. Conversely, porous, permeable sands will reveal a faster thermal recovery from an altered temperature state. At 3150 ft the gradient flattens out, on the more sensitive scale it can be observed that the gradient is decreasing from 3155 ft to 3169 ft, at this point the temperature rises slightly to a depth of 3200 ft. From 3200 ft there is a decrease in temperature to a low at a depth of 3320 ft. The temperature begins to rise up to and through the targeted injection zone. Below the perforations, at 3424 ft the temperature decreases once more.

Since long-term injection yields long-term cooling, it is important to note that the area around the injection zone is still cool, as explained above. The injection, being more porous has recovered faster than the adjoining shales.



ATLAS WIRELINE SERVICES

Logging Program and Analysis (Cont.)
Hoecsh Celanese Chemical Corporation, Inc. Well No. 2
Page 2

The temperature fluxuations around the packer do not inherently mean that there is a problem. This can be explained by the changes in metal mass and the temperature conductivity changes that can occur and cause fluxuations in the area around the packer.

Conclusion:

From the temperature alone, there is not any conclusive evidence of a leak or other interformational fluid movement. The injection interval appears to be taken all if not the majority of the fluids being injected into the well. The major temperature change occurs in the target injection interval.



ATLAS WIRELINE SERVICES

94061
API NO.

API NO.

WELL

NO. 2 MEL - MDR 14

CURRENTTEE THE ACCURACY OR CORRECTNESS

GUARANTEE THE ACCURACY OR CORRECTNESS OF ANY INTERPRETATION. WE SHALL NOT BE LIABLE OR RESPONSIBLE FOR ANY LOSS, COST, DAMAGES, OR EXPENSES WHATSOEVER INCURRED OR SUSTAINED BY THE CUSTOMER RESULTING FROM ANY INTERPRETATION MADE BY ANY OF OUR EMPLOYEES.

FINAL PRINT

COUNTY	MATAGORDA	STATE	TX.
LOCATION:	BAY CITY PLANT		
OTHER SERVICES	TRACER		

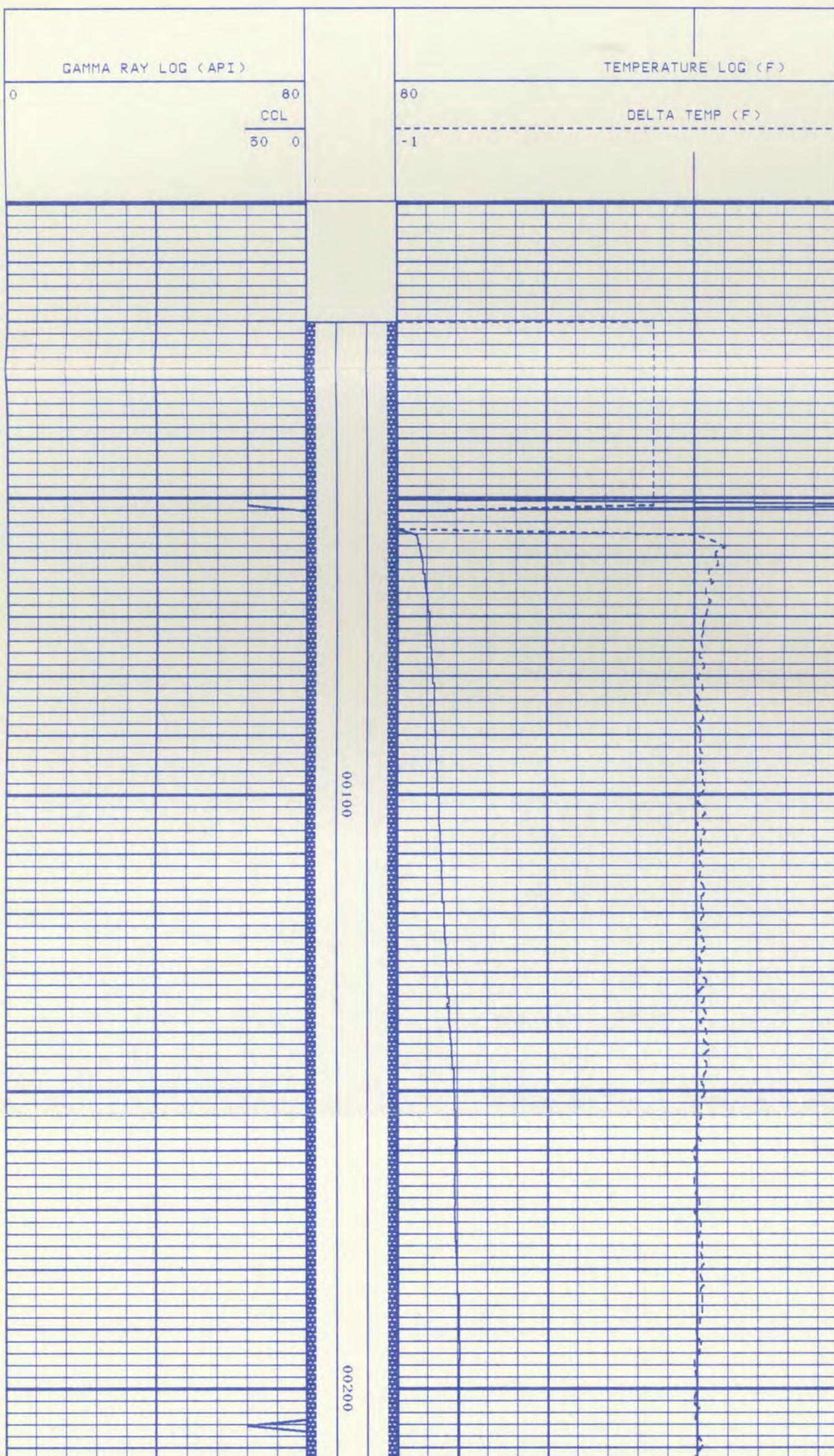
FOLD HERE

CASING RECORD			
SIZE	MGT	FROM	TO
5.5 T	20	0	3162
9 5/8	N/A	0	3650

REMARKS RUN (1)

TOOL CONFIGURATION WAS ONE DETECTOR ABOVE AND BELOW INJECTOR
PUMP-IN RATE OF 20 GPM. ESTABLISHED FOR CHASE DOWN RUNS.
PUMP-IN RATE OF 50 GPM. ESTABLISHED FOR STATIONARY READINGS.
WELL SHUT-IN 48 HRS. PRIOR TO LOGGING TEMPERATURE RUN (2/21).
LOG TIED INTO OPEN HOLE LOG DATED 1964 (WELEX).

TEMPERATURE LOG - SHUT IN 48 HRS.

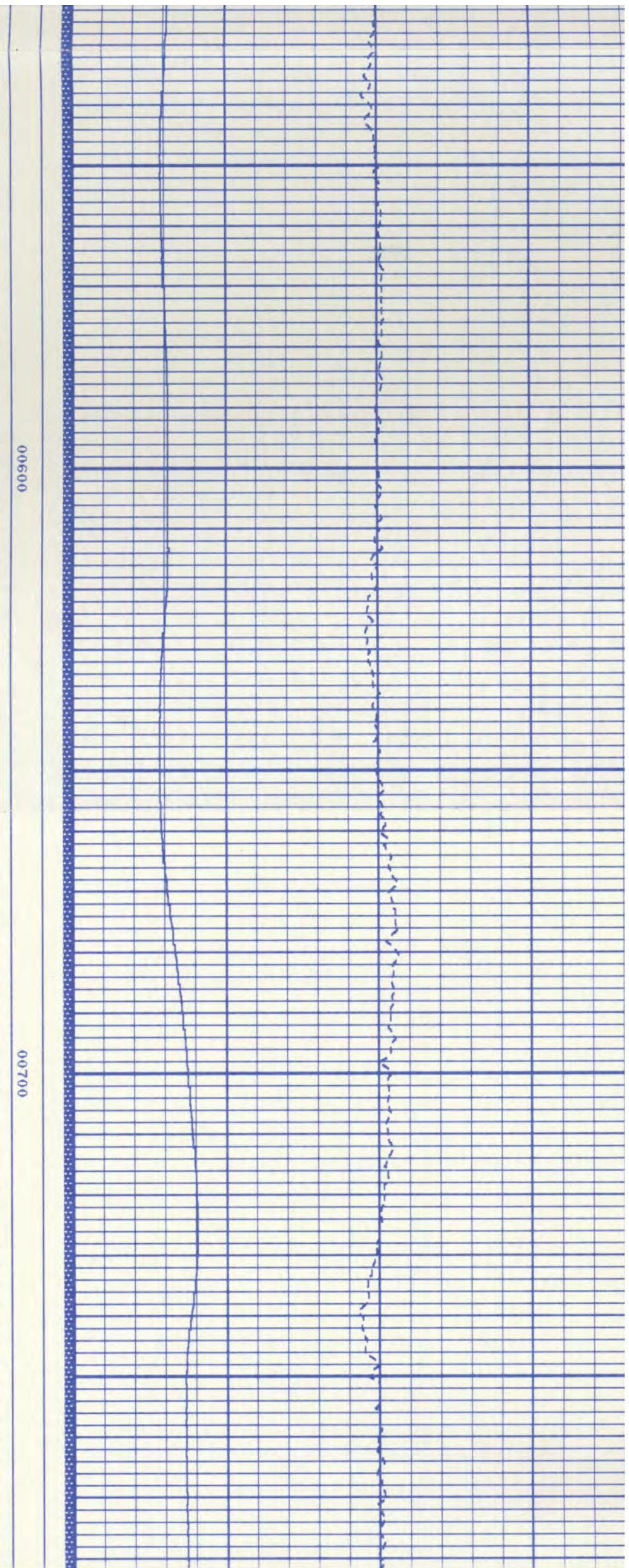
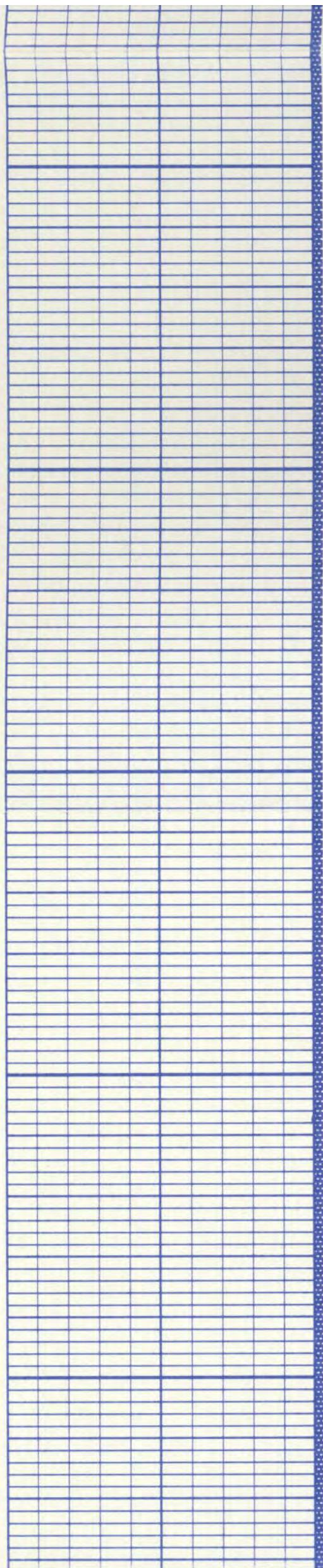


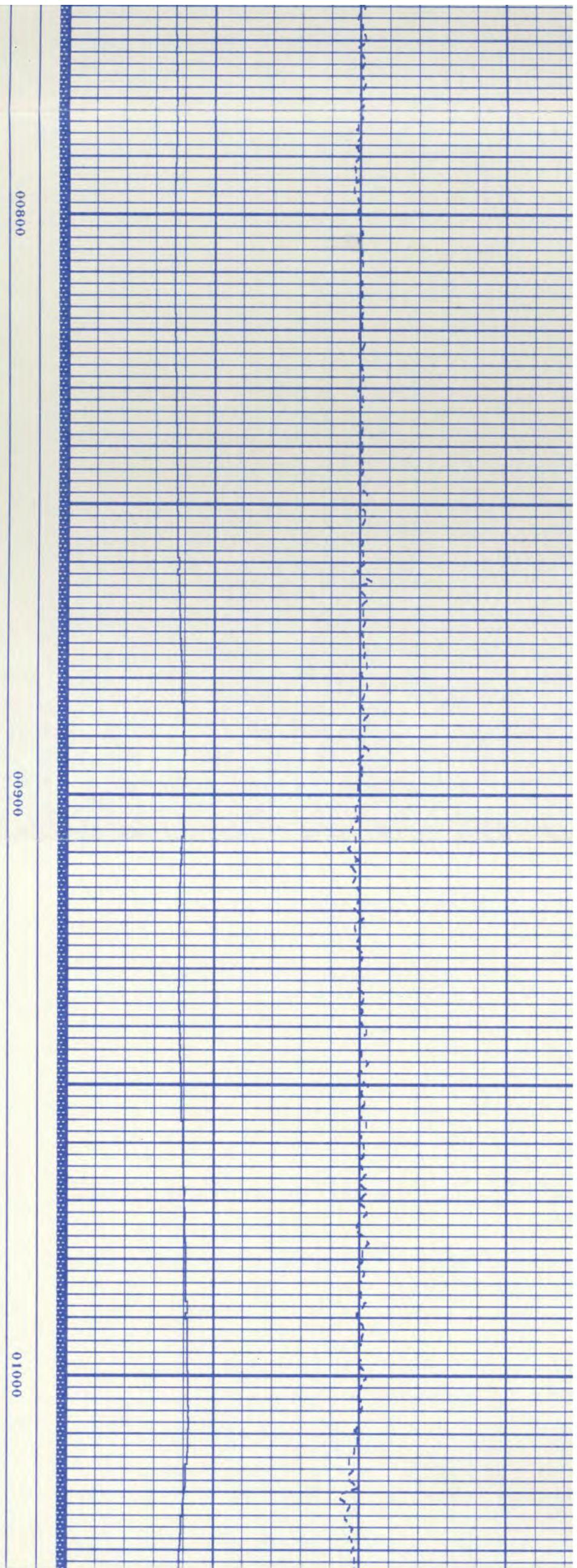
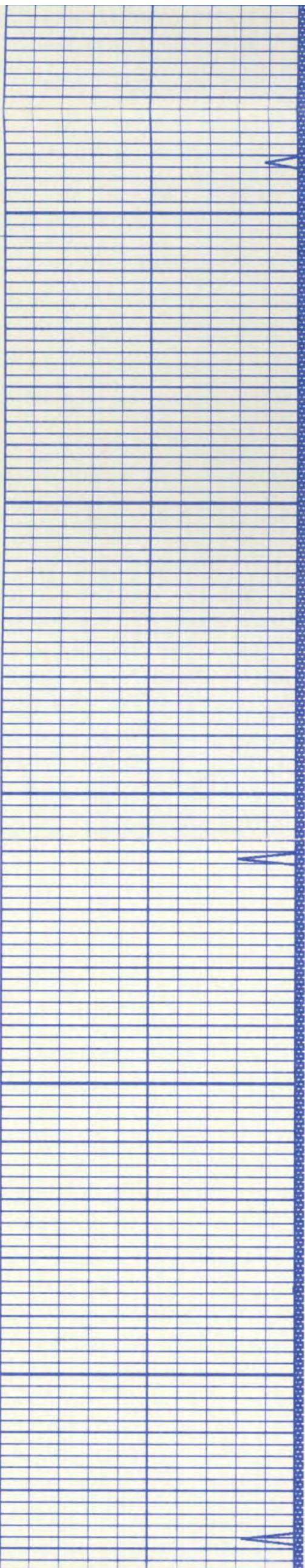
MOMENTARY TOOL STOPPAGE AT THIS POINT

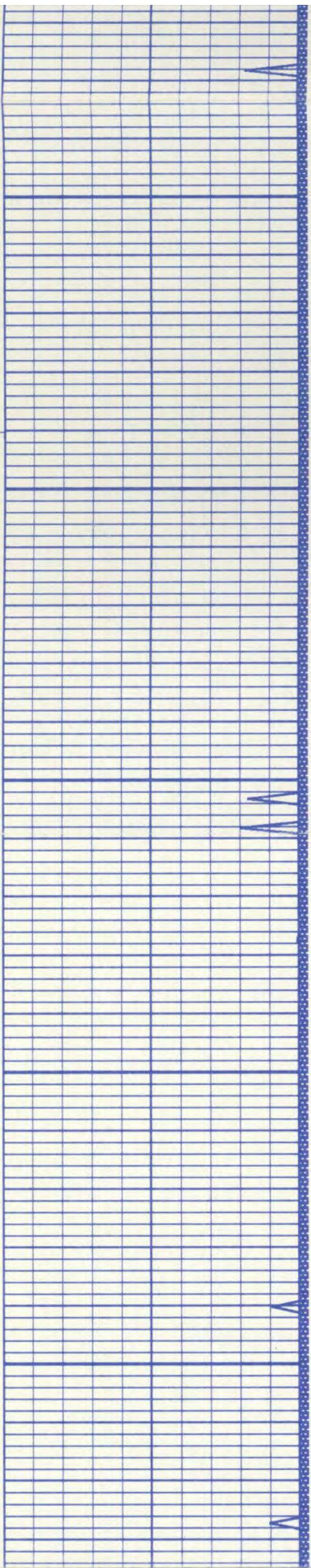
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00400

00500

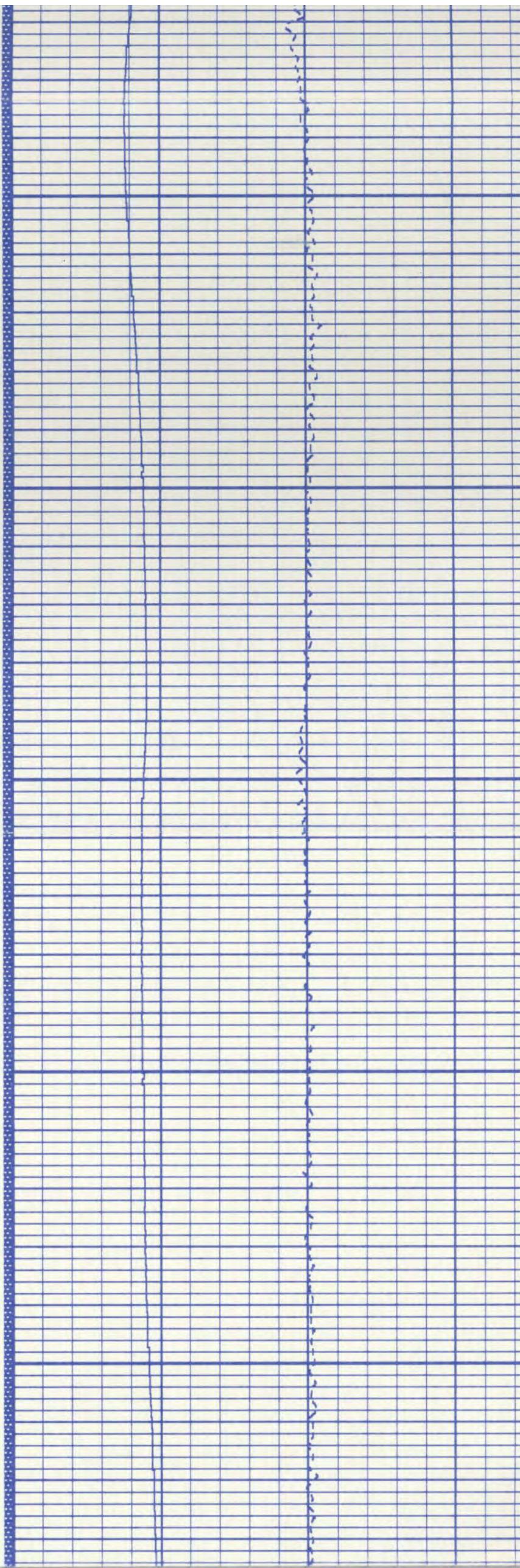


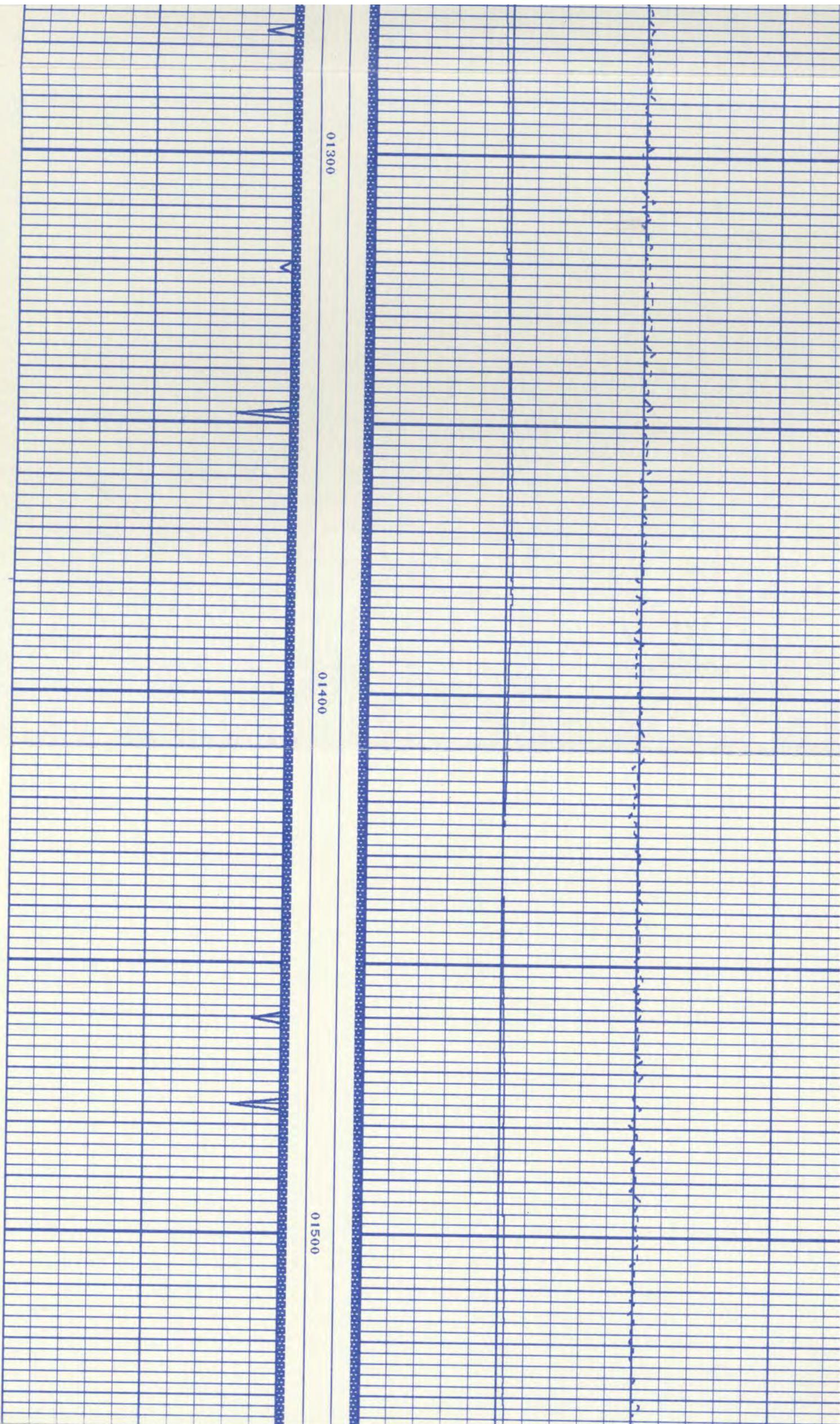


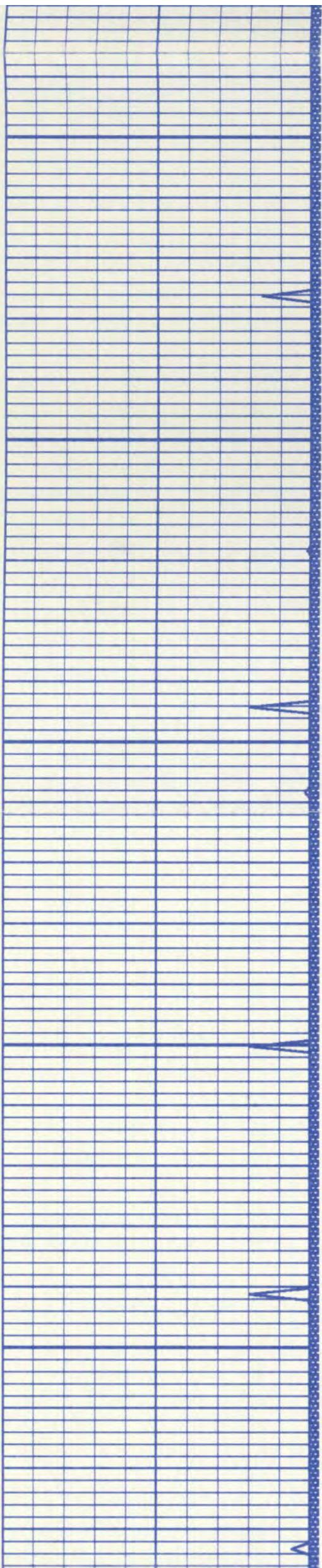


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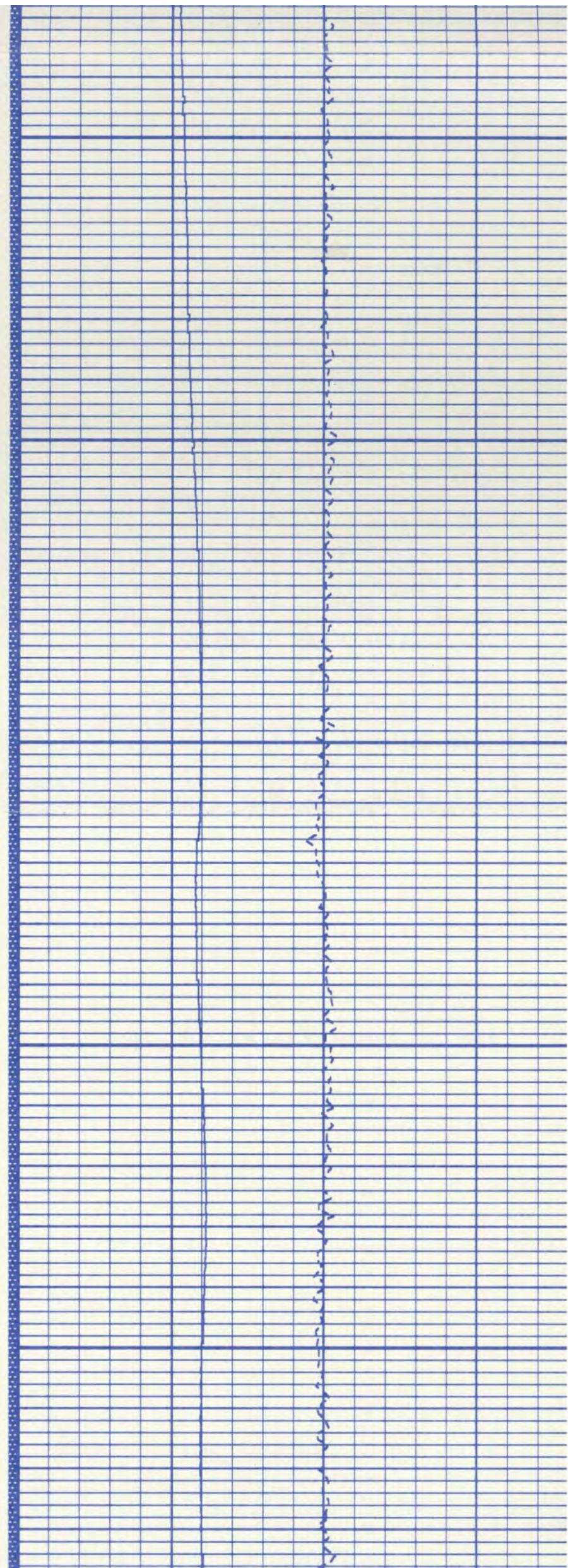
01200







01600
01700



V

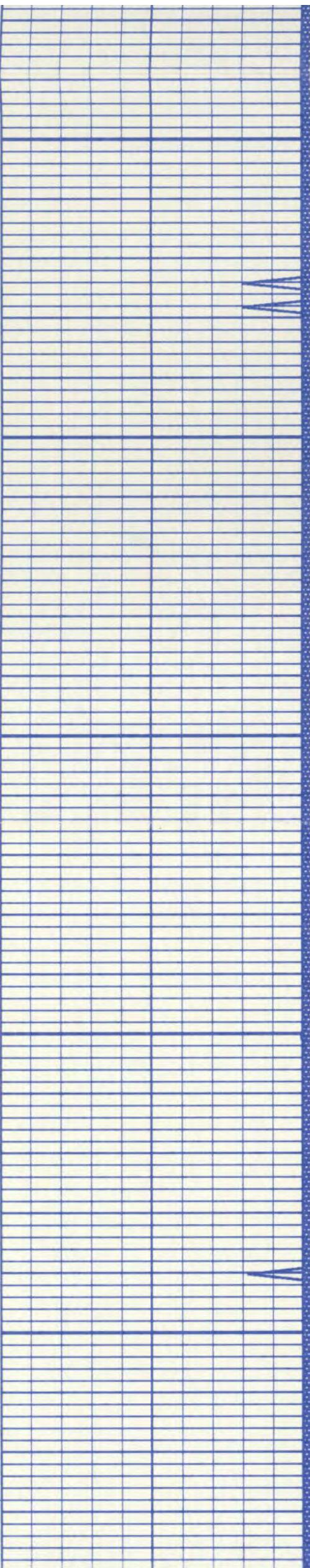
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01900

02000

02100

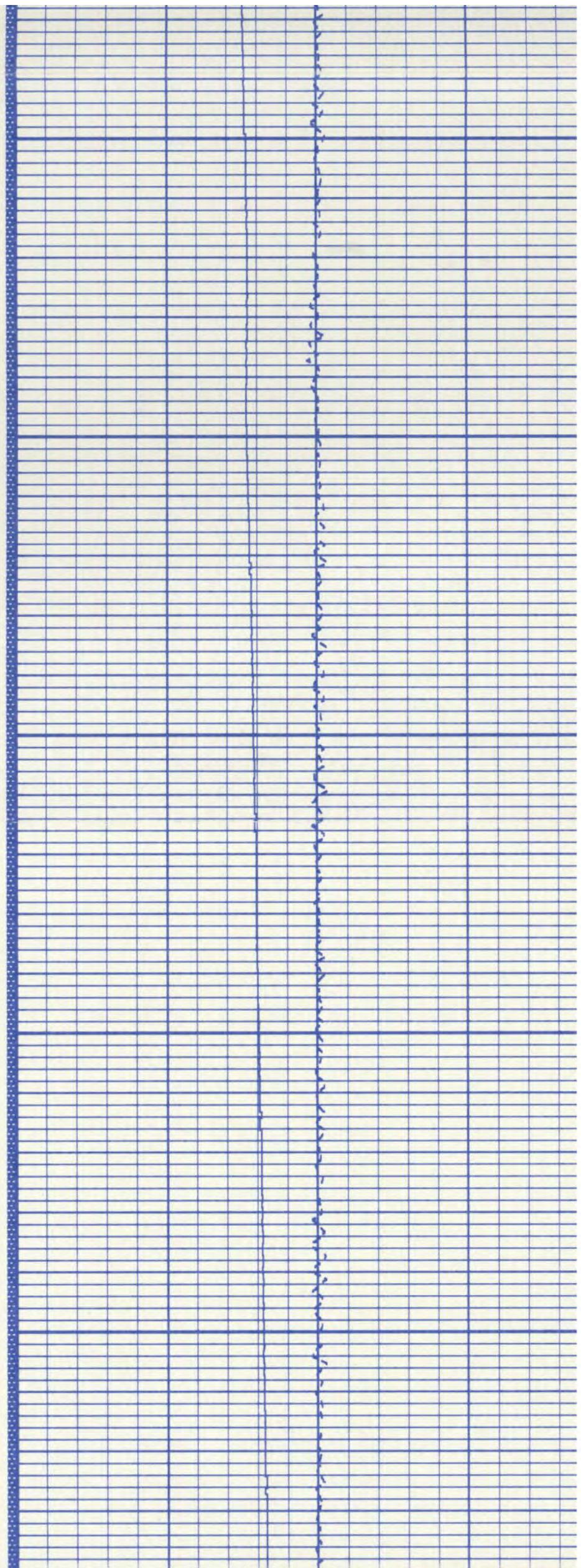
02200



02300

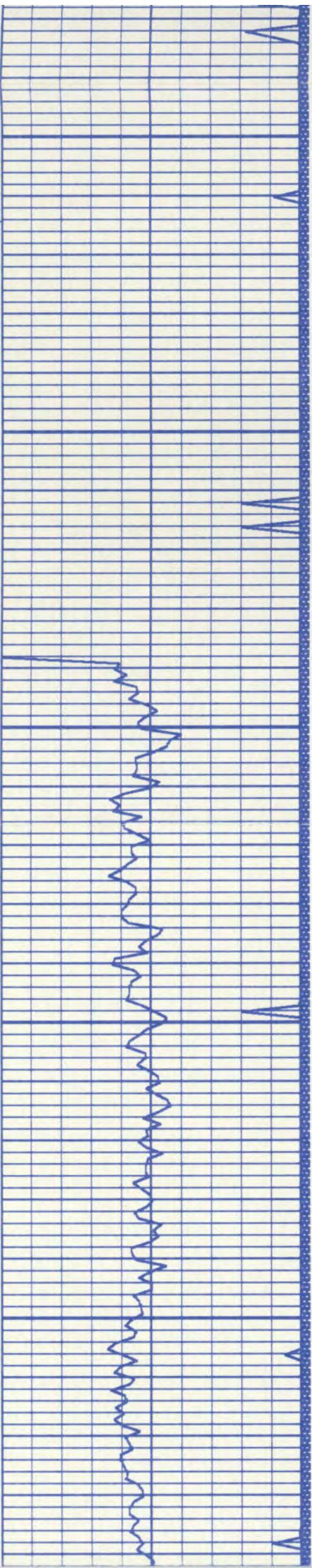
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02500



02600

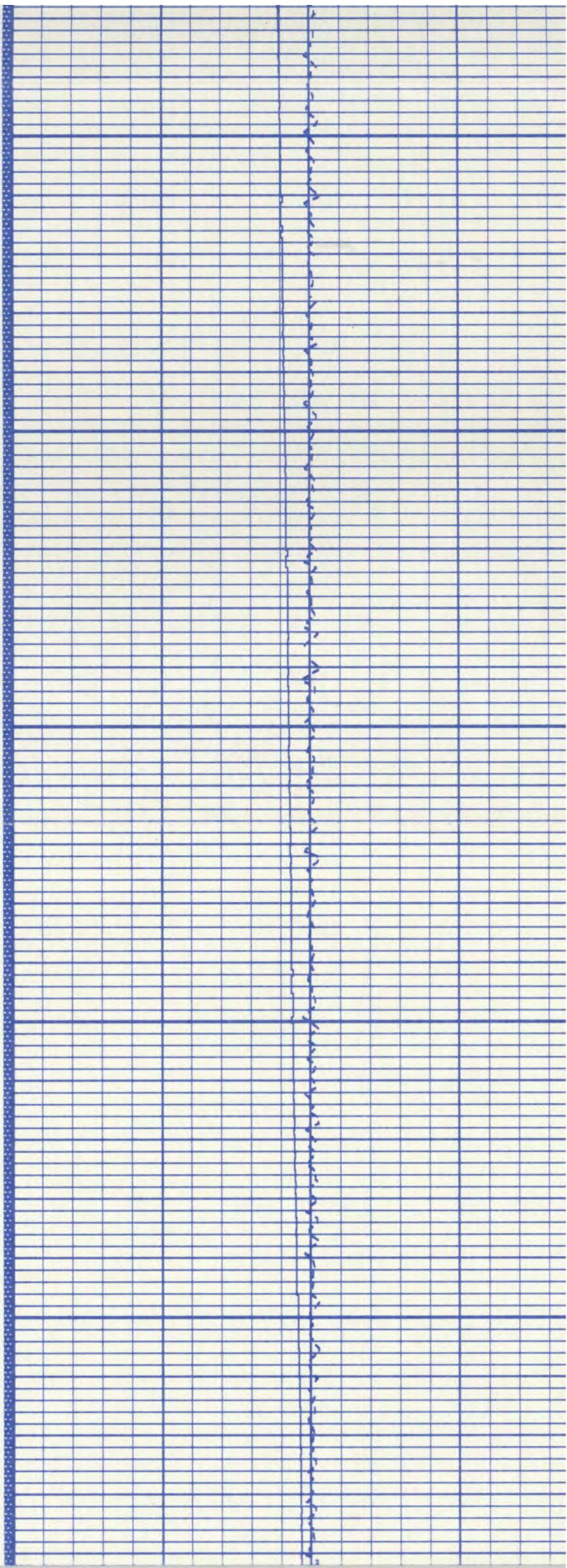
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02800

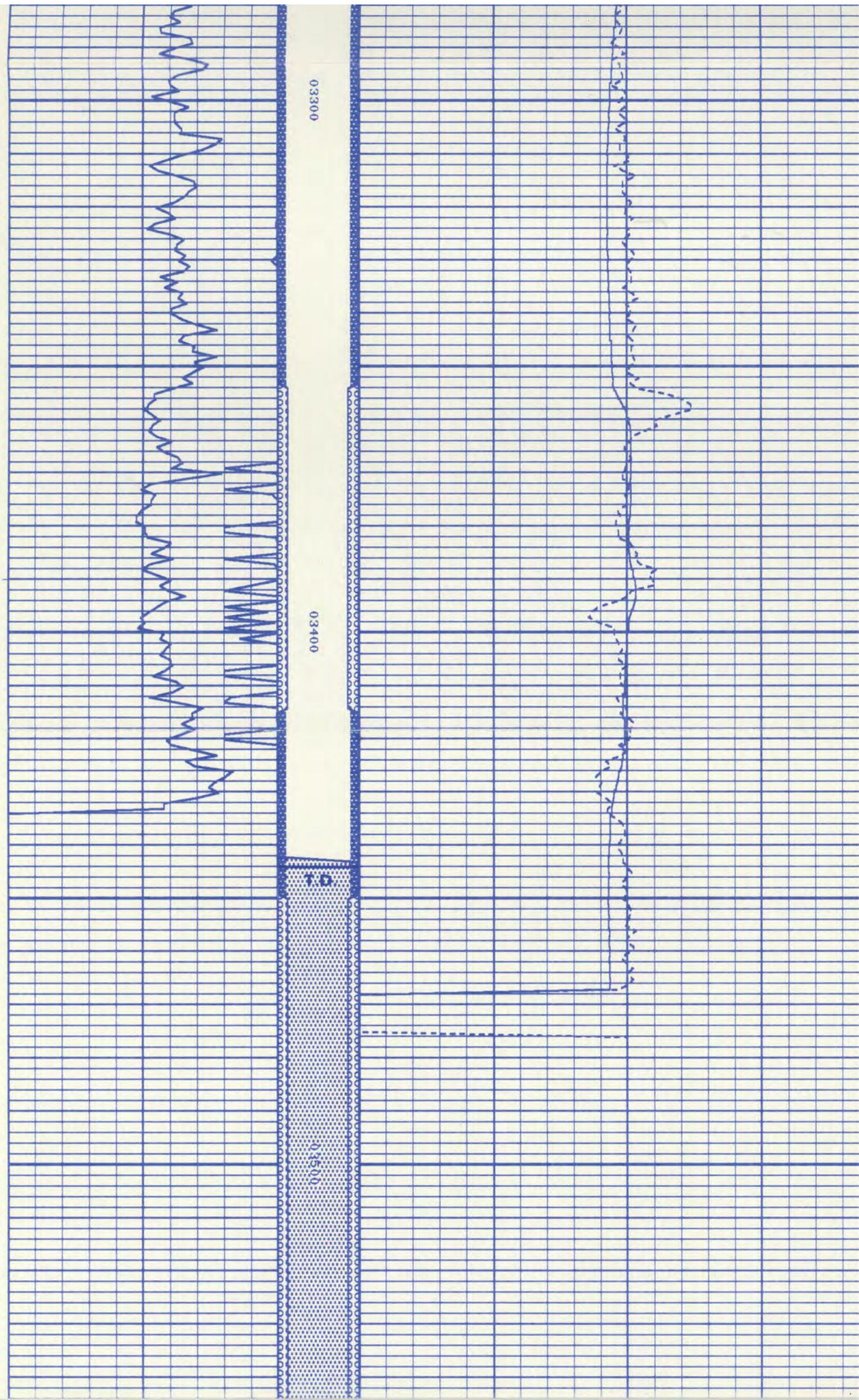
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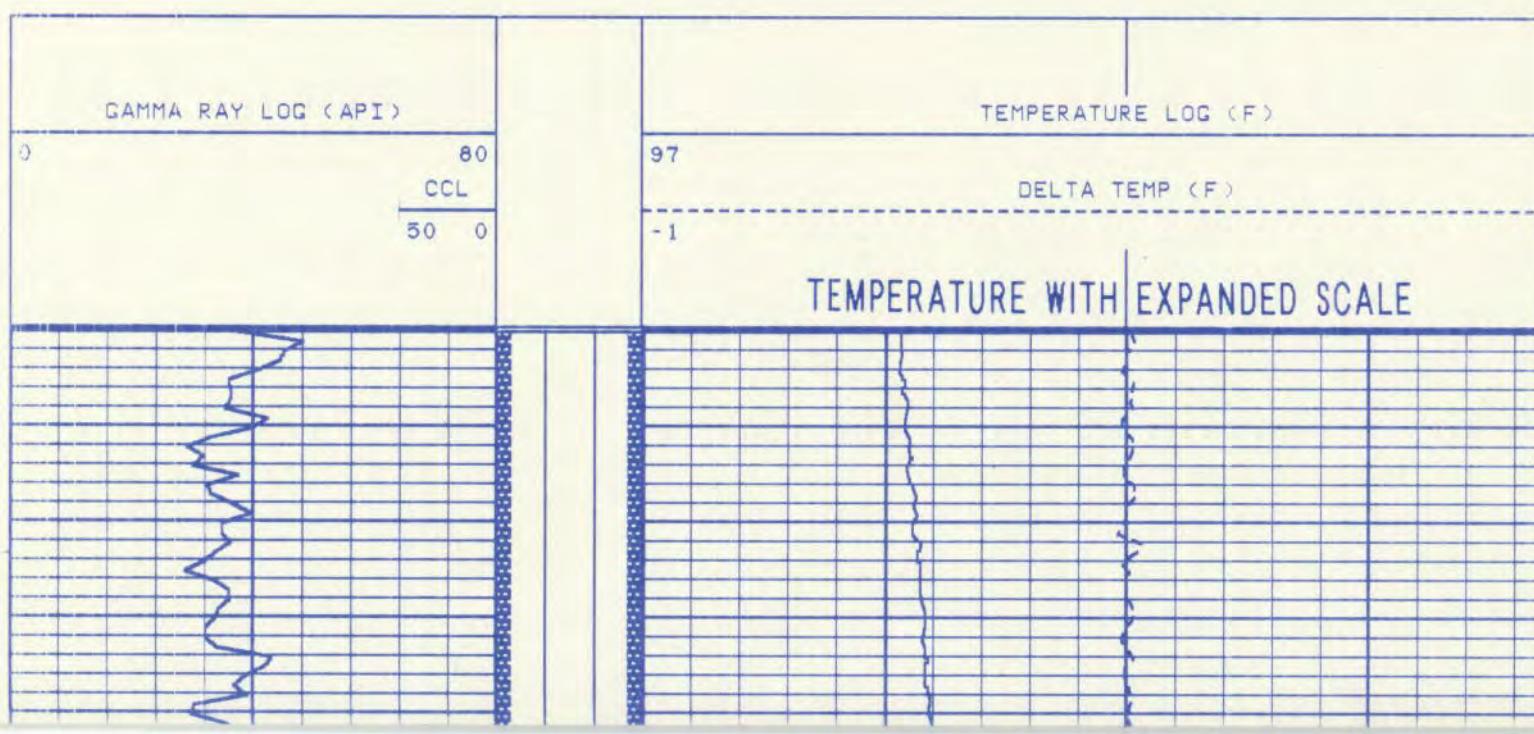
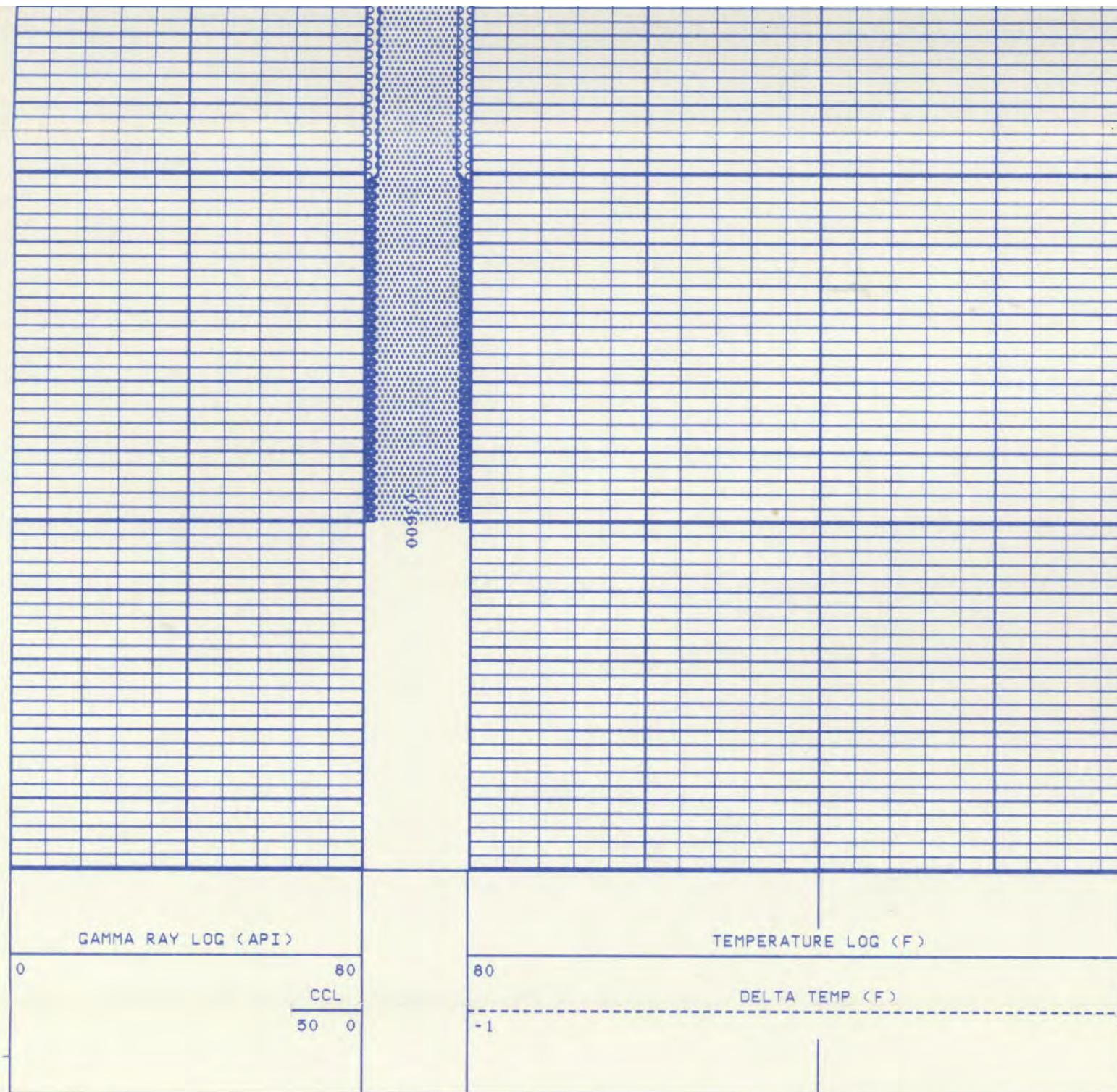
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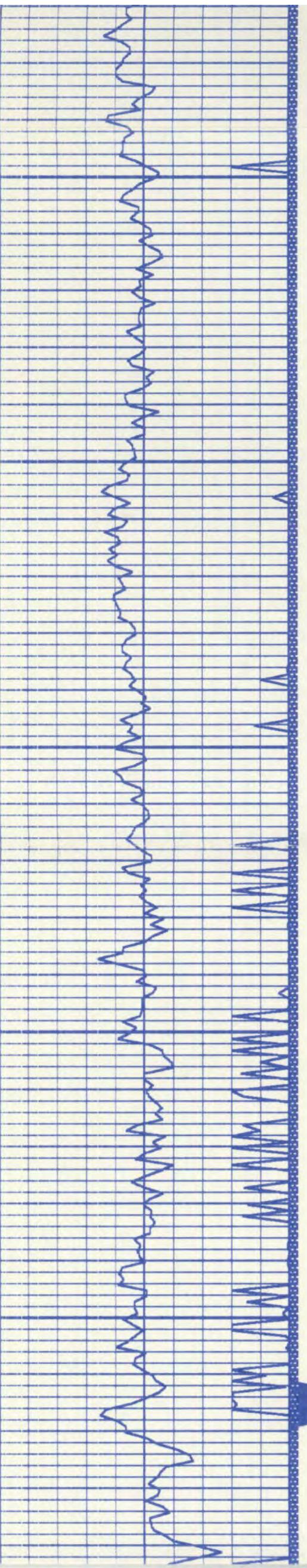


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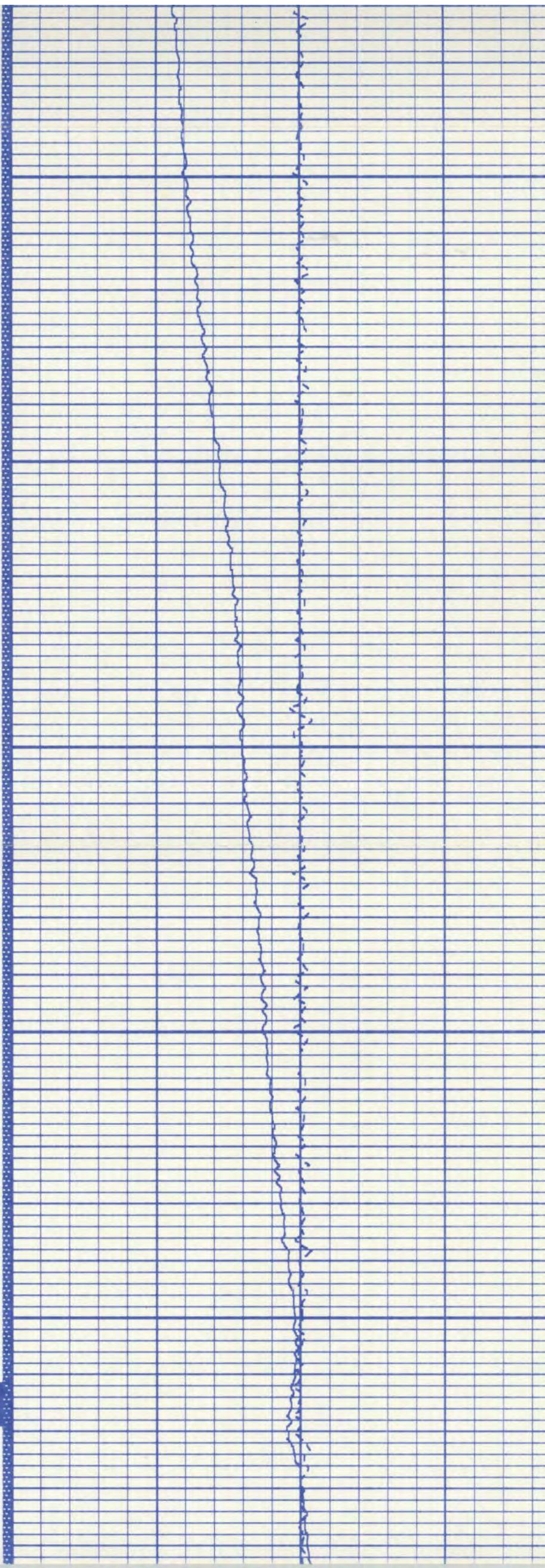
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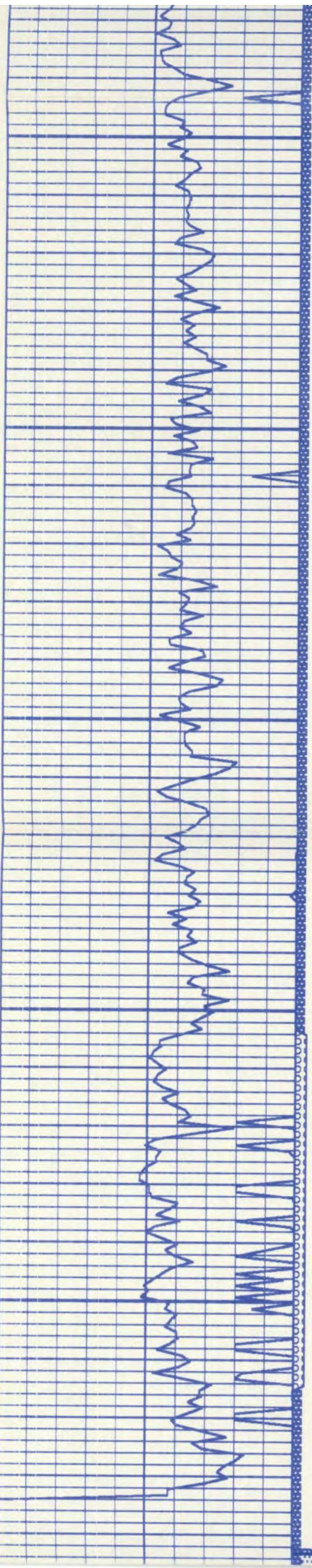




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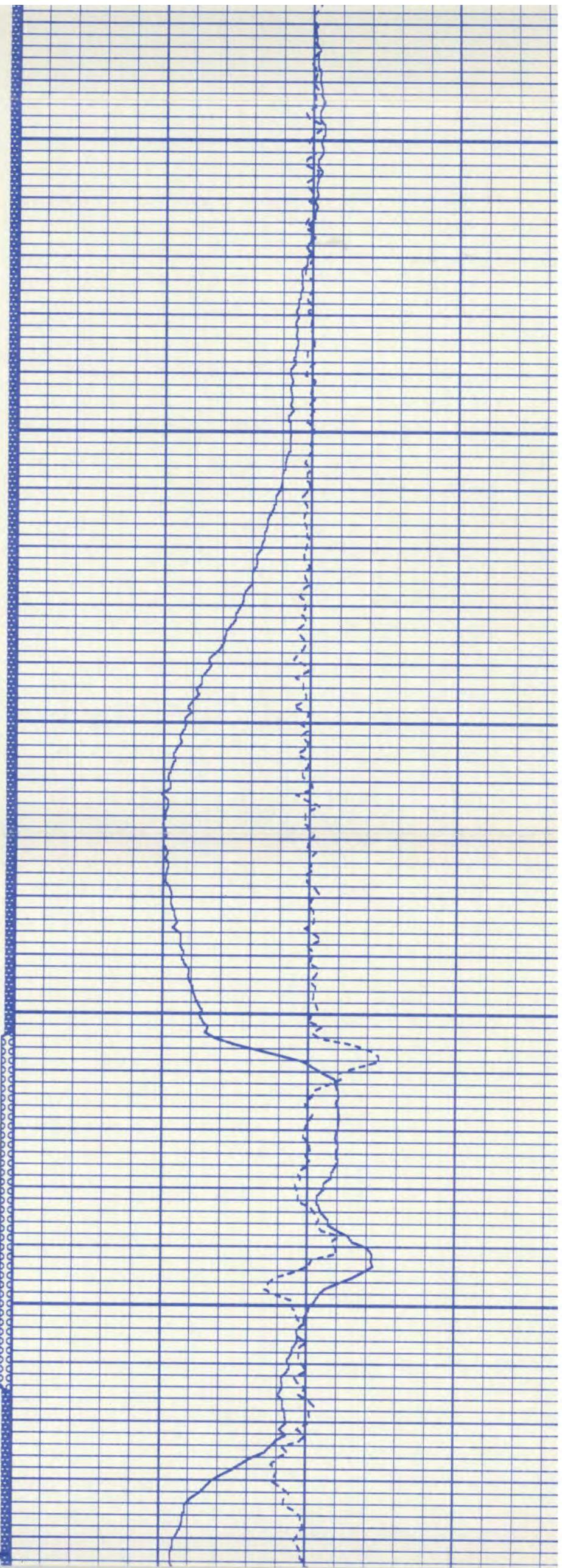
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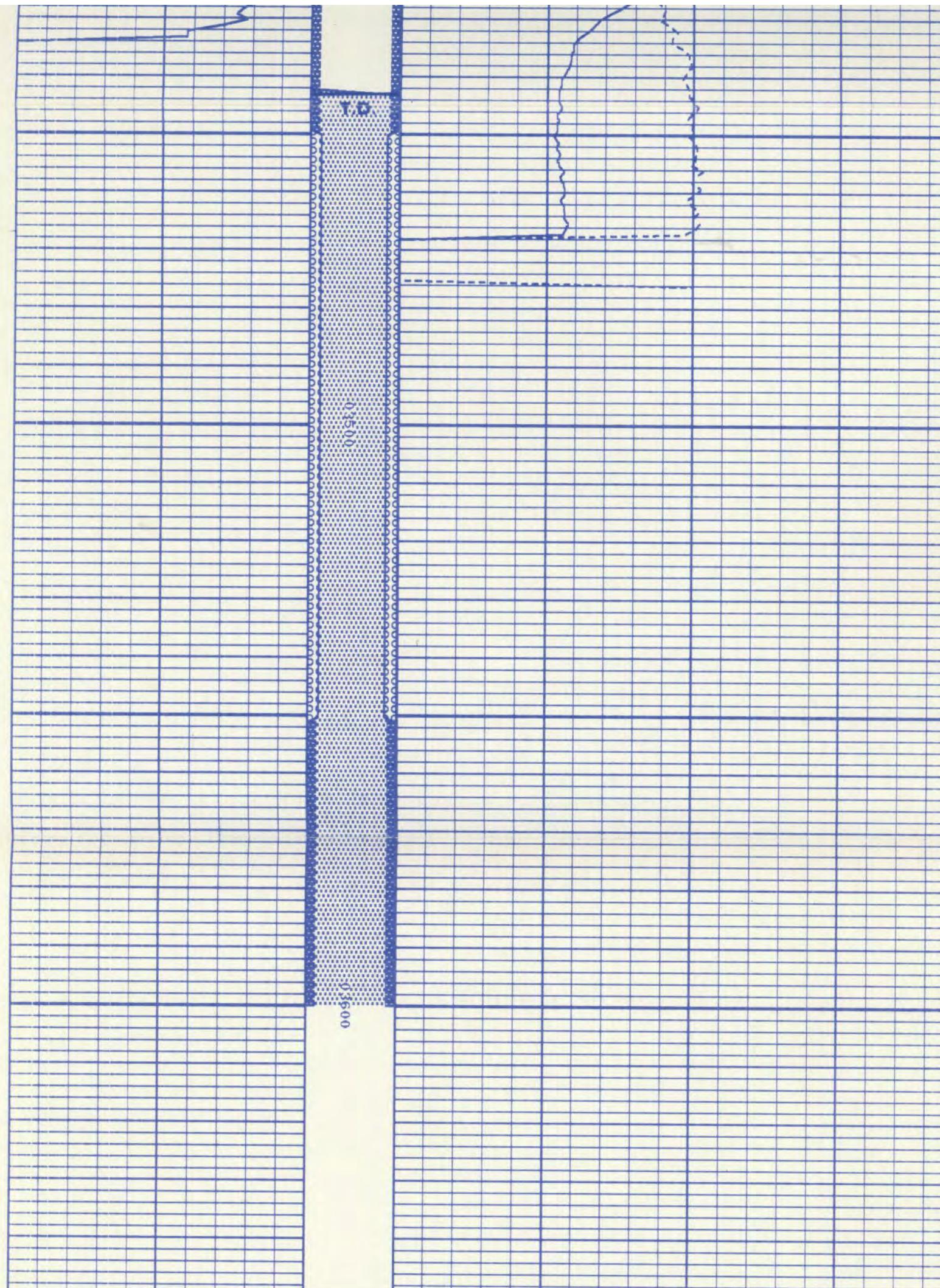


03200

03300

03400





GAMMA RAY LOG (API)

0	80
CCL	
50	0

TEMPERATURE LOG (°F)

97

DELTA TEMP (°F)

-1

**ECO Solutions, Inc.
Hoechst Celanese Chemical Group, Inc.
Pressure Falloff/MIT Testing**

APPENDIX H

ANNULUS PRESSURE TEST

**ECO Solutions, Inc.
Hoechst Celanese Chemical Group, Inc.
Pressure Falloff/MIT Testing**

APPENDIX H

ANNULUS PRESSURE TEST

1020m

LEVEL
ANN PRS H 56.3IX LUL
DIF PRS H 886.6PSIG
INJ PRS H 314.9PSI
Feb. 21 250cm³/h 75.8PSIG
17:00 0.0 INJ PRS PRB

1000.0 P DIF FRS

PSTU

LEVEL

DIF PRS H1 17:03

ANN FRS H2 17:01

DIF PRS H1 17:01

FEB. 21 9:00 16:57
INJ PRS 75.7PSIG DIF PRS H 314.9PSI
ANN PRS H 886.7PSIG LEVEL 56.25% -UL

INJ PRS

DIF FRS

LEVEL

DIF PRS 0.00 DIF FRS
LEVEL PRS 50.00

LEVEL

100.00
X UL

INJ PRS
INJ PRS

DIF FRS

LEVEL

DIF PRS
DIF FRS

LEVEL

0.0 INJ PRS 10 20 30 40 50 DIF FRS 60 70 80 90 100

ANN PRS

LEVEL

INJ PRS

DIF FRS

LEVEL

0.0 INJ PRS 0 500.0 DIF FRS 150.0 INJ PRS

ANN PRS

LEVEL

INJ PRS

DIF FRS

LEVEL

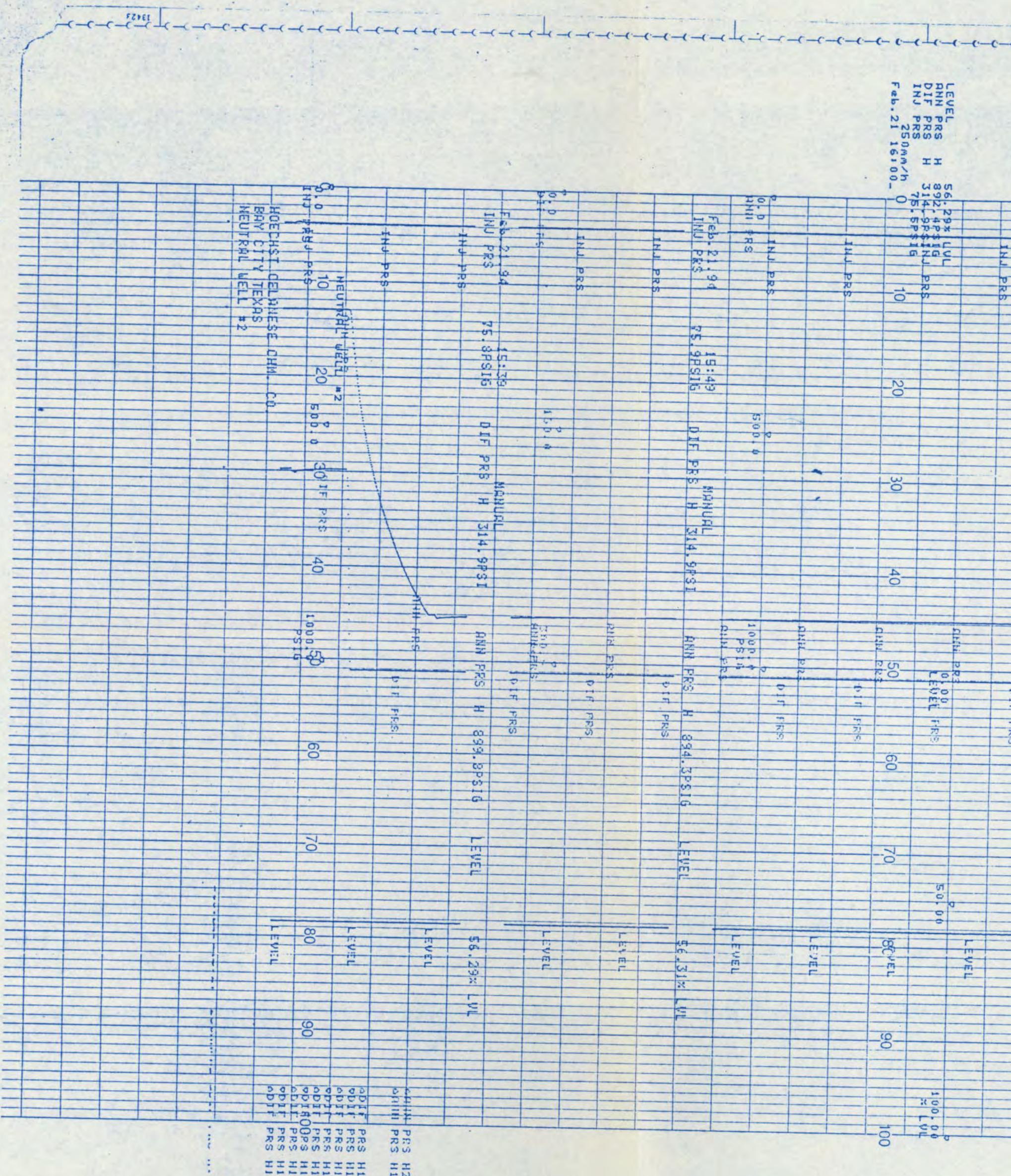
0.0 INJ PRS 500.0 DIF FRS 1000.0 INJ PRS

ANN PRS

LEVEL

KOKUSAI OHAGATI
1035cm

YOKOGAWA ♦



**ECO Solutions, Inc.
Hoechst Celanese Chemical Group, Inc.
Pressure Falloff/MIT Testing**

**APPENDIX I
CORRESPONDENCE**

94-004

Hoechst Celanese

January 7, 1994
IOC-002-94

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

CERTIFIED MAIL

Mr. Mike Mishra
Underground Injection Control Unit
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, TX 78711-3087

Subject: Revised (January 7, 1994) Proposed Mechanical
Integrity Testing Procedures and Additional
Information
WDW-14 and WDW-110
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas
(Reference Letter, IOC-097-93,
(dated December 7, 1993))

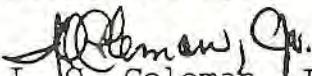
Dear Mr. Mishra:

Pursuant to your telephone request on Wednesday, January 5, 1994, please find included with this transmittal the following:

- Addendum I - Detailed mechanical integrity test procedures and well schematic for WDW-14,
- Addendum II - Detailed mechanical integrity test procedures and well schematic for WDW-110,
- Addendum III - Bottom hole pressure falloff procedure for both WDW-14 and WDW-110, and
- Addendum IV - Revised bottom hole pressure falloff schedule for both WDW-14 and WDW-110.

If you have any questions, contact me at (409) 241-4197.

Respectfully,


I.O. Coleman, Jr.
Environmental Section Leader

IOC/cjs
attachments

Hoechst 

cc:

Mr. Larry Walker, Geologist
UIC Team
UIC, Uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, TX 78711-3087

Mr. Chuck Green
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, TX 78711-3087

Mr. Phil Dellinger, USEPA Region VI
Environmental Protection Agency, Region VI
Emergency Response Branch (6E-E)
1445 Ross Ave.
Dallas, Tx 75202-2733

Mr. Tom Jones, ECO
ECO Solutions
10333 Richmond Avenue
Suite 250
Houston, TX 77042

Mr. Bob Hall, ECO
ECO Solutions
10333 Richmond Avenue
Suite 250
Houston, TX 77042

PROPOSED PROCEDURES TO DEMONSTRATE
MECHANICAL INTEGRITY TESTING
HOECHST CELANESE - CHEMICAL GROUP
WDW-14
BAY CITY FACILITY

The following step-by-step proposed mechanical integrity testing (MIT) procedures were developed in accordance with the Underground Injection Control (UIC) and the Hazardous Waste Disposal Injection Restrictions (HWDIR) Programs issued by the United States Environmental Protection Agency (US EPA) and promulgated by the Texas Natural Resources Conservation Commission (TNRCC). Except where noted, all steps of this procedure will be performed by ECO Solutions Inc. (ECO) personnel.

- 1) Request and secure approval from the TNRCC to demonstrate MIT (HCCG & ECO).
 - * Define annulus pressure test, type logging tools and downhole logging procedures and submit to HCCG .
 - * HCCG will draft a letter which will provide formal notification to the TNRCC of the intent to demonstrate MIT.
 - * HCCG will issue the letter to the TNRCC for review and acceptance.
 - * Receive approval letter from TNRCC on proposed MIT.
- 2) Notify the TNRCC field inspector of the scheduled MIT (HCCG).
 - * Verbally notify the field inspector of the date field work is scheduled and the estimated starting time for the first test to be witnessed by the TNRCC.
 - * Determine the intent of TNRCC to field witness MIT.
 - * Determine desire of TNRCC for any special documentation of test results.

3) Prepare well for MIT (HCCG).

- * Test master valve to make sure that it will open, close and seal off properly.
- * Check wellhead valves to insure that standard fittings can be installed during the MIT. ECO requests that a 2" NPT connection, or standard oil field size adapter, be available on the tubing and casing outlets.
- * HCCG's personnel will be set-up to maintain proper annulus pressure while conducting the radioactive tracer (RAT) survey.
- * Close well in 48 hours prior to performing annulus pressure test/temperature survey.

4) Perform annulus pressure test.

- * Install calibrated pressure gauge onto the annulus. Also, HCCG will furnish and install a pressure recorder.
- * HCCG's personnel will slowly pressurize the annulus using nitrogen gas to +/- 800 psig. The annulus is reportedly filled with inhibited brine.
- * Monitor casing pressure for a minimum period of 60 minutes. Maximum allowable pressure leak-off rate during test is 5% of maximum test pressure.
- * Gradually bleed off annulus pressure to normal operating level.

5) Run temperature survey and radioactive tracer (RAT) survey.

- * Rig up electrical wireline service unit including two gamma ray (G/R) detectors, casing collar locator (CCL) and radioactive tracer (RAT) ejector tool and temperature tools.. Ejector contains +/- 5 millicuries of Iodine 131 radioactive (R/A) solution.
- * Run temperature survey from surface to either the top of fill or plug back total depth.
- * Run initial base G/R log from just below perforated section up to +/-300' above the packer (@3162'), or up to +/-2800. Make repeat G/R run in cased section to prove G/R tool repeatability.
- * Run one (1) five-minute statistical log at a depth of 3340'.

- * Commence pumping non hazardous effluent fluid down tubing using HCCG's injection pumps at a steady rate.
- * Release first R/A slug inside tubing at +/-2800' while pumping fluid down the tubing at the rate of +/-40 gpm. Make multiple recorded passes following the R/A slug (1) down the tubing, (2) into the borehole and (3) into the disposal zone until the R/A slug virtually disappears and cannot be distinguished from the normal background G/R radioactivity.
- * Release second R/A slug. Repeat multiple pass survey above.
- * Release third R/A slug from tool at +/-3340'. Hold tool stationary with a pump rate of approximately 100 gpm. Place recorder on time-drive sequence. Logging time will be predetermined based on actual injection rate and as agreed upon with the TNRCC inspector.
- * Release fourth R/A slug from tool at +/-3340. Repeat stationary survey above.
- * Run final base G/R from just below base of perforated section up to +/-2800' (same interval as original base G/R log) to verify that all R/A materials have been flushed into the disposal zone and that no fluid is migrating up behind the casing strings. Pull tool out of the hole.

6) MIT field work is completed.

- * Rig down all rental equipment and either move to the next injection well or off the location.

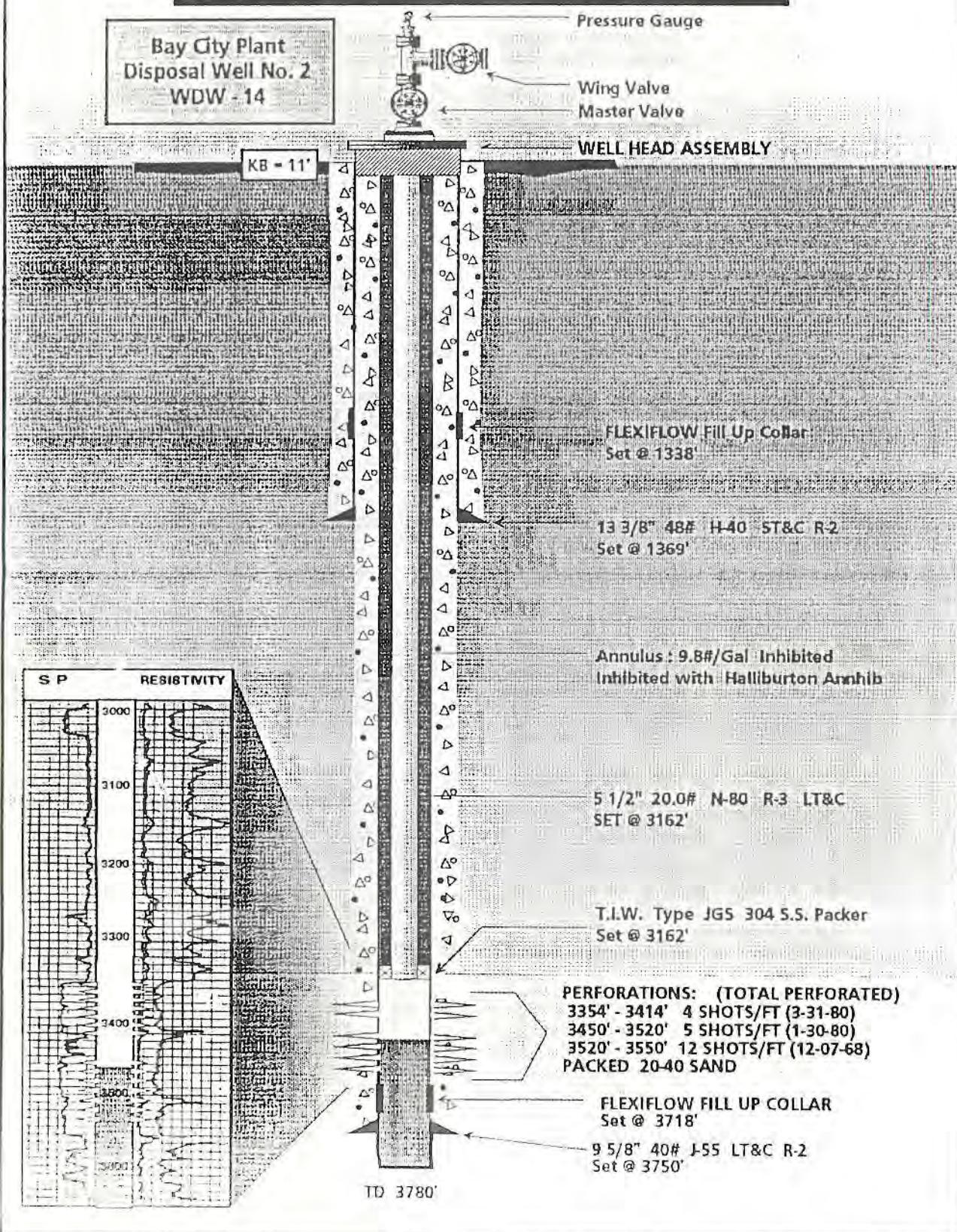
7) Submit MIT report (HCCG & ECO).

- * Prepare a draft MIT report detailing the demonstration of MIT on WDW No. 14.
- * Submit draft report to HCCG for comments and approval (ECO).
- * ECO will correct the MIT report as required and issue 5 copies of the final report to HCCG.
- * HCCG will submit report to the TNRCC for review and approval.
- * HCCG will receive TNRCC's acceptance of the MIT report.

8) Mechanical Integrity Testing Complete.

FIGURE 7.1

HOECHST CELANESE CHEMICAL GROUP, INC.



**BOTTOM HOLE PRESSURE FALLOFF TESTING
WDW NOS. 14 & 110**

**HOECHST CELANESE - CHEMICAL GROUP
BAY CITY, TEXAS**

Prepared by ECO Solutions

The following is an overview of the proposed bottom hole pressure falloff test procedures for WDW-14 and WDW-110. The falloff test procedures feature the shutting-in of adjacent, onsite, injection wells prior to conducting each falloff test.

Effluent samples will be taken prior to and during each falloff test. Specific gravity and viscosity measurements will be taken on each sample at simulated bottom hole temperature.

ECO Solutions will provide an engineer on-site with the appropriate computer software for analysis of each falloff test.

- 1) WDW-49 will remain brined in while conducting bottom hole pressure falloff testing on WDW-14 and WDW-110.
- 2) Maintain high constant injection rates on WDW-14 for approximately four (4) days prior to conducting falloff test on same.
- 3) Approximately 48 hours prior to conducting bottom hole pressure testing on WDW-14, shut-in WDW-110 and WDW-32.
- 4) Install surface readout bottom hole pressure gauges in WDW-14 and monitor/record flowing bottom hole pressure for approximately 24 hours.
- 5) Conduct bottom hole pressure falloff test on WDW-14.
- 6) Place WDW-14, WDW-32 and WDW-49 back in service for approximately one week prior to conducting falloff testing on WDW-110.
- 7) Maintain high constant injection rates on WDW-110 for approximately four (4) days prior to conducting falloff test on same.

- 8) Approximately 48 hours prior to conducting bottom hole pressure testing on WDW-110, shut-in WDW-14 and WDW-32.
- 9) Install surface readout bottom hole pressure gauges in WDW-110 and monitor/record flowing bottom hole pressure for approximately 24 hours.
- 10) Conduct bottom hole pressure falloff test on WDW-110.
- 11) Place all wells back in service.
- 12) Prepare and submit report detailing field activities to Texas Natural Resources Conservation Commission

Interoffice Memo

Hoechst Celanese

Date: October 13, 1992

GMQ-621-92

To: H. R. Horton

From: G. M. Quinney

Dept/Location: Maintenance Engineering

Dept/Location: Maintenance

Subject: Well Instrumentation

The well instrumentation for #2, #3 and #4 wells at the Bay City Plant is the Honeywell ST 3000. Its accuracy is $\pm .1\%$ of full span in the analog mode. The ST 3000 transmitter is calibrated via the Smart Field Communication Model STS 102.

G. M. Quinney

 Hoechst

Condensed Specifications

Output	Combined zero and span temperature effect per 28°C (50°F)	Meter body temperature limits -40° to +125°C (-40° to +257°F)
Linear or square root	Analog Mode: ±0.175% span	Damping
Analog Mode: 4-20 mA dc	Digital Mode: DE protocol	Adjustable from 0-32 seconds
Digital Mode: DE protocol	Analog or digital mode selectable by SFC	
Analog or digital mode selectable by SFC		
Accuracy (Reference)	<i>Combined zero and span static pressure effect per 70 bar (1000 psl) - DP models only</i>	Overpressure
Analog Mode: ±0.1% span	Analog Mode: ±0.2% span	210 bar (3000 psi) for DP models; 1.5 X upper range limit for GP models
Digital Mode: ±0.075% span or ±0.15% reading whichever is smaller	Digital Mode: ±0.2% reading	
		Supply voltage
	Ambient temperature limits -40° to +93°C (-40° to +200°F)	11 to 45 Vdc

ST 3000 Transmitter Ranges		
Measurement	Model	Min-Max Span
Differential Pressure	STD 120	1-400 in H ₂ O
	STD 125*	25-600 in H ₂ O
	STD 130	5-100 psi
	STD 170	100-3000 psi
	STD 624	25-400 in H ₂ O
Flange Mount	STF 128	10-400 in H ₂ O
	STF 132	5-100 psi
	STF 12F	1-400 in H ₂ O
	STF 13F	5-100 psi
	STD 14F*	25-600 in H ₂ O
	STF 62F	25-400 in H ₂ O
Remote Seal	STR 126	10-400 in H ₂ O
	STR 130	5-100 psi
Gage Pressure	STG 140	5-500 psi
	STG 170	100-3000 psi
	STG 180	100-6000 psi
	STG 644	5-500 psi
	STG 674	100-3000 psi
Absolute Pressure	STA 122	10-780 mmHg
	STA 140	5-500 psi

*ITG

Honeywell

Industrial Automation and Control

Honeywell Inc.

1100 Virginia Drive

Fort Washington, PA 19034

Helping You Control Your World

Honeywell34-ST-03-13
5/89
Page 1 of 3

SFC Smart Field Communicator

Model STS102

Specification

Function

The hand-held SFC Smart Field Communicator is a battery-powered device which establishes two-way communication between Honeywell Smart Transmitters and an operator over the existing transmitter signal lines, thereby simplifying maintenance and providing operator access to transmitters without a trip to the field. The operator can send data to and receive data from the transmitter's microprocessor, through the SFC, when connected to the transmitter signal lines at any accessible location from the control room to the transmitter. The SFC is in an impact-resistant housing and comes with a weather-proof carrying case, a NiCad rechargeable battery pack, and a dc recharger.

Description

Model STS102 is capable of communicating with ST 3000 differential pressure, gauge pressure and absolute pressure transmitters, with the STT 3000 Smart Temperature Transmitter, with the Smart MagneW 3000 Magnetic Flowmeter and with future additions to the Honeywell Smart Field Architecture.

You can use the SFC to:

Select the Communication Mode:

Command the transmitter to transmit its output signal in either an analog (4-20 mA) mode or in the Digital Communications (DE) Mode.

Configure: Enter the desired operating parameters (LRV, URV, damping, fail-safe mode, input actuation type for STT, etc.) into the transmitter.

Diagnose: Access the Smart Transmitter self-diagnostic capabilities to troubleshoot suspected operation or communication problems.

Calibrate: The SFC provides a simplified procedure for calibrating Smart Transmitters, thus maintaining excellent transmitter accuracy with significantly reduced maintenance requirements. Note that Honeywell Smart Transmitters can be re-ranged from a remote location without the need to apply input signals from calibration standards.



Figure 1—SFC Smart Field Communicator

Display: Readout all configured operating parameters from the transmitter as well as other data such as PROM/Serial No., tag no., sensor temperature (ST), hi/lo PV (STT), scratch pad memory (ST), etc. Also displays measured input values (pressure, differential pressure, temperature, flow velocity) in selected engineering units for readout by the operator. All readouts can be displayed in English, German, French or Spanish.

Checkout: Put the transmitter in the Output Mode and you can command the Smart Transmitter to transmit a precise signal, selectable from 0% to 100% full scale, to assist in verifying loop operation, loop calibration or troubleshooting.

Interoffice Memo

Hoechst Celanese

Date February 21, 1994 JMK-074-94
To Ray H. Horton From J. M. Knobeloch
Dept/Location Maintance Eng. Dept/Location Laboratory
Subject Analysis of #2 Well (WDW-14) Feed For Mechanical Integrity Testing

cc: W. C. Comman G. E. Organ R. S. O'Neal
N. C. Stafford E. H. Chiu B. A. Logue
B. L. Fritz J. L. Popejoy C. M. Grey

Samples collected by Area 1 operators were analyzed for specific gravity and viscosity at a temperature of 120 F. The analyses below were preformed by Clark M. Grey.

Sample Date	Time	Specific Gravity	Viscosity (cps)
2-14-94	8 AM	0.9943	1.55
2-14-94	3 PM	0.9949	1.51
2-15-94	2 AM	0.9950	1.44
2-15-94	7 AM	0.9950	1.53
2-15-94	3 PM	0.9943	1.46
2-16-94	7 AM	0.9946	1.50
2-16-94	11 PM	0.9946	1.44
2-17-94 *	7 AM *	0.9990	1.70
2-17-94	7 AM	0.9946	1.44
2-17-94	3 PM	0.9946	1.49
2-17-94	11 PM	0.9948	1.49

* Note: There were two samples labeled 7 AM on 2-17-94, I called Control Room 7 and talked to Jerry West to find out when the operator who signed the sample tag was working. The operator who signed the tag was not at work on the 17th. I am not sure where the sample fits into the scheme of things.

If any additional information is required please call me.



John M. Knobeloch

VISCOSITY of LIQUIDS

This method describes the measurement of the viscosity of a liquid using a Cannon-Fenske viscometer. This method is applicable over a broad range of temperatures. For a in depth discussion of viscosity see (Technique of Organic Chemistry Volume I - Part I "Physical Methods of Organic Chemistry". Third Edition, Interscience Publishers, New York 1959 pages 703-705). In order to find the viscosity you will need to obtain a factor for the apparatus, actual measurements of your sample, and the density of your sample.

- 1) Set an iso-thermal bath to the temperature at which you wish to measure the viscosity and let it equilibrate.
- 2) Fill the reservoir of the Cannon-Fenske viscometer half full of nanopure water. Submerse this viscometer until almost all of it is under the water in the iso-thermal bath. Give the viscometer 10-15 minutes to equilibrate.
- 3) Use a pipet bulb to pull the water into the top bulb of the two smaller bulbs of the viscometer. Remove the bulb and replace with your finger to hold the liquid in place.
- 4) Release the liquid by removing your finger. Time using a stop watch the time it takes the meniscus to travel starting from when the meniscus touches the line between the two small bulbs to when it touches the line below the lower of the two small bulbs. (Repeat this 3 times and take the average)
- 5) Look up in a reputable hand book such as the CRC Handbook of Chemistry and Physics the viscosity (in cps) of water at the temperature you are running at. (see attached page)
- 6) Calculate the factor for the Cannon-Fenske viscometer using the equation below.

Factor = Viscosity of water at Temperature (cps) / Time (sec)

After you have found a factor for the viscometer you are ready to start testing on your sample.

- 7) Remove the water from the viscometer and dry.
- 8) Follow the instructions listed above starting with #2 going through #4 using the same procedure except that you will be using your sample instead of water.
- 9) Obtain the density (g per ml) of the sample you are running at the same temperature it is tested at.

Viscosity = (Time in sec) X (Factor) X (Density in g per ml)

This equation will give you viscosity in centipoise (cps)

THE VISCOSITY OF WATER 0°C TO 100°C

Contribution from the National Bureau of Standards *not subject to copyright.*

°C	η (cp)	°C	η (cp)	°C	η (cp)	°C	η (cp)
0	1.787	26	0.8705	52	0.5290	78	0.3638
1	1.728	27	.8513	53	.5204	79	.3592
2	1.671	28	.8327	54	.5121	80	.3547
3	1.618	29	.8148	55	.5040	81	.3503
4	1.567	30	.7975	56	.4961	82	.3460
5	1.519	31	.7808	57	.4884	83	.3418
6	1.472	32	.7647	58	.4809	84	.3377
7	1.428	33	.7491	59	.4736	85	.3337
8	1.386	34	.7340	60	.4665	86	.3297
9	1.346	35	.7194	61	.4596	87	.3259
10	1.307	36	.7052	62	.4528	88	.3221
11	1.271	37	.6915	63	.4462	89	.3184
12	1.235	38	.6783	64	.4398	90	.3147
13	1.202	39	.6654	65	.4335	91	.3111
14	1.169	40	.6529	66	.4273	92	.3076
15	1.139	41	.6408	67	.4213	93	.3042
16	1.109	42	.6291	68	.4155	94	.3008
17	1.081	43	.6178	69	.4098	95	.2975
18	1.053	44	.6067	70	.4042	96	.2942
19	1.027	45	.5960	71	.3987	97	.2911
20	1.002	46	.5856	72	.3934	98	.2879
21	0.9779	47	.5755	73	.3882	99	.2848
22	.9548	48	.5656	74	.3831	100	.2818
23	.9325	49	.5561	75	.3781		
24	.9111	50	.5468	76	.3732		
25	.8904	51	.5378	77	.3684		

The above table was calculated from the following empirical relationships derived from measurements in viscometers calibrated with water at 20°C (and one atmosphere), modified to agree with the currently accepted value for the viscosity at 20° of 1.002 cp:

$$0^\circ \text{ to } 20^\circ \text{C: } \log_{10} \frac{\eta}{\eta_0} = \frac{1301}{998.333 + 8.1855(T-20)} - 3.30233$$

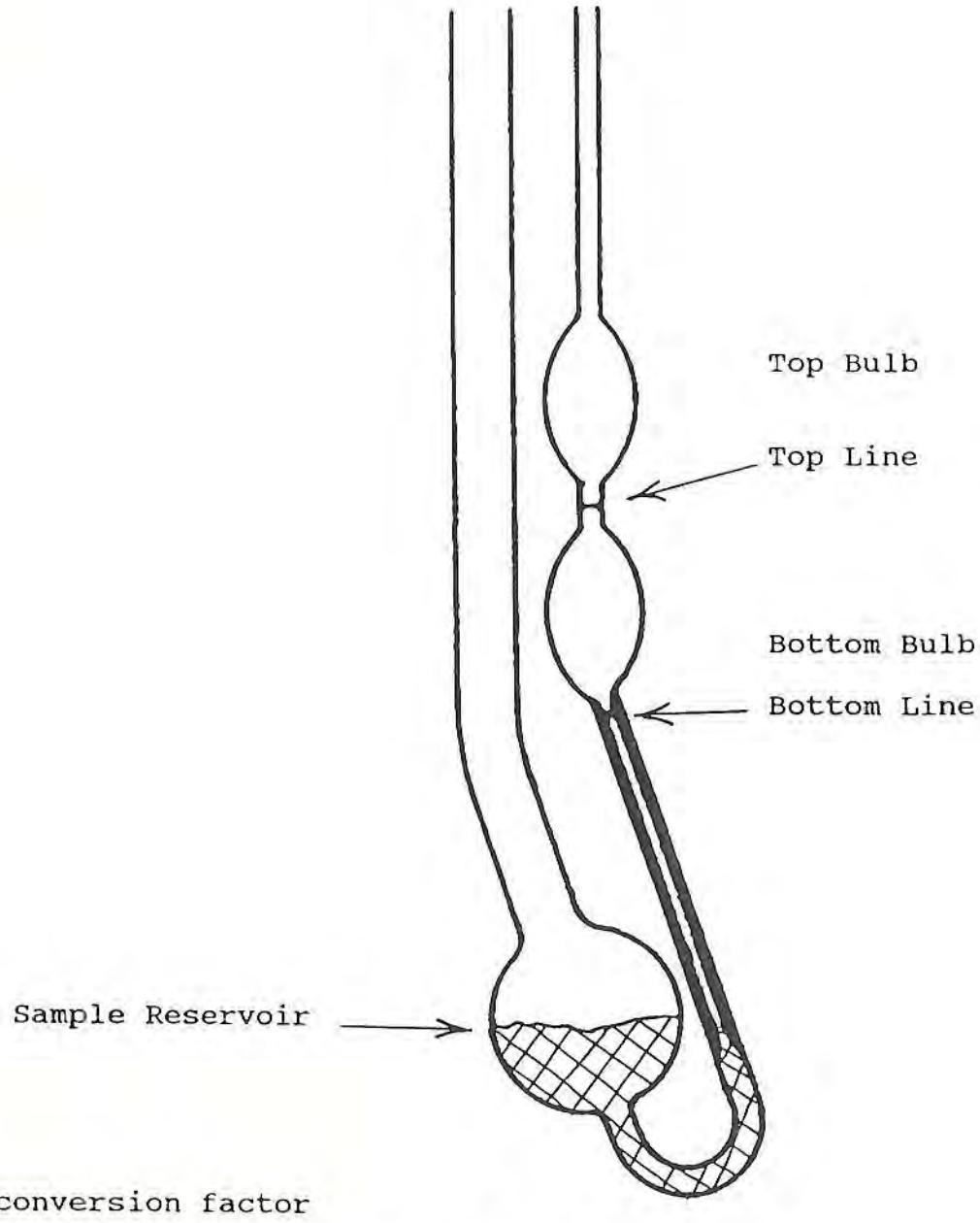
(R. C. Hardy and R. L. Cottington, J.Res.NBS 42, 573 (1949).)

$$20^\circ \text{ to } 100^\circ \text{C: } \log_{10} \frac{\eta}{\eta_{20}} = \frac{1.3272(20-T) - 0.001053(T-20)^2}{T + 105}$$

(J. F. Swindells, NBS, unpublished results.)

from 53rd Edition 1972-1973
of CRC Handbook of
Chemistry & Physics

CANNON-FENSKE VISCOMETER



conversion factor

$$\text{Centipoise} = \text{Centistokes} \times \text{Density}$$

This method was put together March 31, 1994 by Clark M. Gray
and John M. Knobeloch.

**ECO Solutions, Inc.
Hoechst Celanese Chemical Group, Inc.
Pressure Falloff/MIT Testing**

APPENDIX J

NOTICE OF FAILURE OF MECHANICAL INTEGRITY TEST

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City TX 77404-0509

February 25, 1994
IOC-017-94

FEDERAL EXPRESS

Mr. Ben Knape, Head
Underground Injection Control Unit
Texas Natural Resource Conservation Commission (TNRCC)
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087

AND

Park 35 Circle Colonnade Building
12015 North IH 35
Austin, Texas 78723

Subject: WDW-14 (Plant Injection Well No. 2)
WDW-49 (Plant Injection Well No. 4)
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas
(Reference Letters, IOC-088-93 and IOC-096-93,
Dated November 3, and December 4, 1993)

Dear Mr. Knape:

Firstly, this letter documents that our injection well, WDW-14, (Plant Well No. 2) did not successfully demonstrate mechanical integrity during the annual mechanical integrity testing the week of February 21, 1994. During the radioactive tracer logging, which was conducted on February 22-23rd., it was determined that a probable casing leak had developed at a depth of 3168 feet. This depth is immediately below the current packer setting depth and above the permitted injection interval. WDW-14 was immediately shut-in following the mechanical integrity testing and will remain shut-in pending development of an action plan to address the situation.

As you are aware, verbal notification of the loss of mechanical integrity was provided Mr. Larry Walker, Inspector, TNRCC, who was on location during the testing. Also, verbal notification of the loss of mechanical integrity of WDW-14 was provided to Mr. Phil Dellinger, Environmental Protection Agency, Dallas, Texas and to you on February 23, 1994. In addition, we communicated that the annulus pressure test and temperature log on WDW-14 were successfully completed.

Hoechst

Secondly, this letter documents our intent to proceed with workover on WDW-49 (Plant Well No. 4). Procedures (included with this letter as ADDENDUM I) associated with the replacement of the injection string were submitted to you in the above reference letter IOC-096-93. No changes to the procedures are proposed. However, we request TNRCC approval of the procedures for the workover to allow field operations to start late during the week of February 28, 1994. (A tentative start date of the workover is Thursday, March 3, 1994. It should be noted that this date may change as the coordination with equipment and suppliers is completed.

Please contact me by telephone at 409/241-4197 if you have comments or questions concerning the notification of loss of mechanical integrity of WDW-14 and our request to approve the workover procedures on WDW-49.

Very truly yours,

I. O. Coleman, Jr./cjs
I. O. Coleman, Jr.

IOC/cjs
attachment

Mr. Larry Walker, Geologist
UIC Team
UIC, uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, TX 78711-3087

Mr. Chuck Green,
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, TX 78711-3087

Mr. Phil Dellinger, USEPA Region VI
Environmental Protection Agency, Region VI
Emergency Response Branch (6E-E)
1445 Ross Ave.
Dallas, Tx 75202-2733

Mr. Tom Jones, ECO
ECO Solutions
10333 Richmond Avenue
Suite 250
Houston, TX 77042

Mr. Bob Hall, ECO
ECO Solutions
10333 Richmond Avenue
Suite 250
Houston, TX 77042

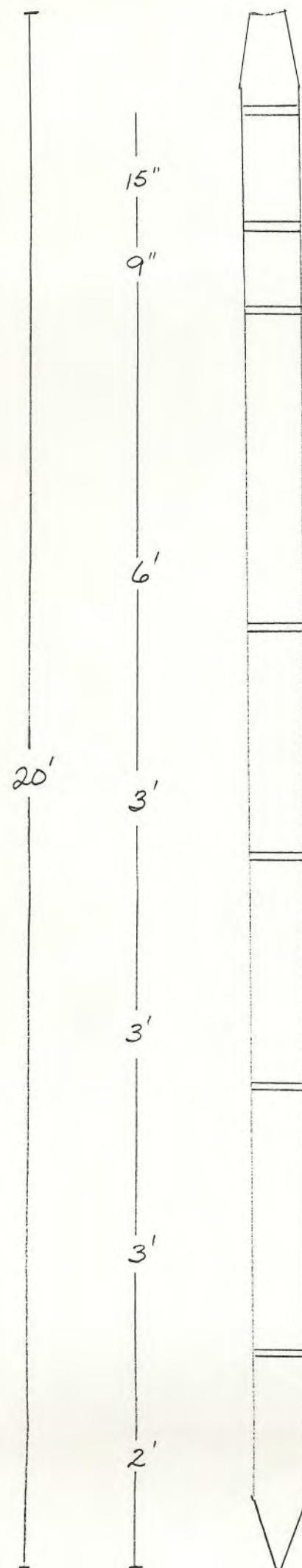
REPAIR PROCEDURES
HOECHST CELANESE BAY CITY PLANT
WELL NUMBER 4

The following plan was developed by Eco Solutions, Inc., to repair the leak in the injection tubing and satisfy five-year Mechanical Integrity Test requirements on Hoechst Celanese number 4 (WDW-49) injection well at Bay City, Texas. Please note that a temperature log was conducted on October 29, 1993.

1. Obtain approval from Texas Natural Resource Conservation Commission
2. Move in an rig up workover rig.
3. Disassemble wellhead and nipple up blowout preventor.
4. Release 5 $\frac{1}{2}$ " injection tubing from packer and pull out of the hole with same.
5. Run electromagnetic casing inspection log from packer depth back to surface.
6. Go in the hole with test seal assembly on workstring and engage packer.
7. Pressure test annulus to 1,000 psig from 30 minutes.
8. Pull out of the hole with test seal assembly - lay down workstring.
9. Go in the hole with redressed seal assembly on new 5 $\frac{1}{2}$ " 20#/ft. N-80 LT&C injection string.
10. Displace annulus with corrosion inhibited brine.
11. Engage packer, nipple down blowout preventor and reassemble wellhead.
12. Pressure test annulus to 1000 psig for 30 minutes.
13. Rig down workover rig.
14. Conduct annulus pressure test and radioactive tracer survey for mechanical integrity test.
15. Place well in non-hazardous service for one week.
16. Perform bottom hole pressure falloff test with non-hazardous effluent.

APPENDIX K

RADIOACTIVE TRACER TOOL LOST IN HOLE



A3HEAD

1 3/8" cablehead

CCL

SW

GR

MAXIMUM I.D.
IS 1.7"

TDET

INJ.

BDET

TEMP.

ECO Solutions, Inc.

**HOECHST CELANESE
CHEMICAL GROUP, INC.
Bay City Plant**

***WORKOVER AND
MECHANICAL INTEGRITY TESING
ON
WDW-49 (WELL NO. 4)***

Prepared by:

*ECO Solutions, Inc.
10333 Richmond Ave., Ste. 250
Houston, Texas 77042*

May 1994

Job No. 94004



Hoechst Celanese

Chemical Group

Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City TX 77404-0509

May 9, 1994
IOC-043-94

FEDERAL EXPRESS MAIL - 8635790590

Mr. Ben K. Knape - Head
UIC Team
UIC, Uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087

Subject: WDW-49 (PLANT WELL NUMBER 4)
WORKOVER AND MECHANICAL INTEGRITY TESTING REPORT
HOECHST CELANESE CHEMICAL GROUP, INC.
BAY CITY PLANT, BAY CITY, TEXAS

Dear Mr. Knape:

Two copies of the Workover and Mechanical Integrity Testing report on WDW-49 are enclosed. These reports are provided for your review and approval. As you are aware, the workover and mechanical integrity testing were performed between March 3rd and March 18, 1994 by our Contractor, ECO Solutions, Inc.

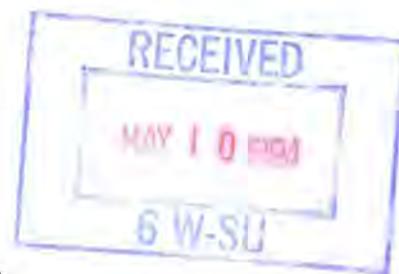
Please contact me at 409/241-4197 or Mr. Ray Horton at 409/241-4076 if you have comments or questions about the report.

Very truly yours,

I. O. Coleman, Jr.
I. O. Coleman, Jr.

cc: Mr. Laurence G. Walker - w/o report
UIC Team
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, Texas 78711-3087

Mr. Phil Dellinger (CERTIFIED MAIL) - w/ report
Underground Injection Control Program
Environmental Protection Agency
1445 Ross Avenue, Suite #1200
Dallas, Texas 75202-2733



ECO SOLUTIONS, INC.

One North Park East, Suite 220
8950 N. Central Expressway, Dallas, TX 75231

214-373-0065
FAX 214-696-2622

ECO Job No. 94004

Friday, May 6, 1994

Sent Via Federal Express

I. O. Coleman
Hoechst Celanese Chemical Group, Inc.
P.O. Box 509
FM 3057
Bay City, TX 77404-0509

RE: Final Report of WDW-49 Workover and Mechanical Integrity Test Report

Dear Mr. Coleman:

You will find enclosed seven (7) copies of the above referenced report on Waste Disposal Well No. 49 (Well No. 4). This final report includes all figures and appendices that will go to the TNRCC.

This final report is past the 30 working day time limit for submittal of reports to the TNRCC. ECO Solutions experienced delays completing this report due to 1) awaiting final copies of the MIT logs, and service company evaluations of these same logs, 2) delays receiving the final analysis report and data from the falloff test report, and 3) lag time reviewing drafts of the final report. These circumstances were outside of ECO Solution's control, but we must accept responsibility for any delays submitting this final report to the TNRCC.

Thank you for the opportunity to be of service to Hoechst Celanese Chemical Group. Should you have any questions, please feel free to call me at 214-373-0065.

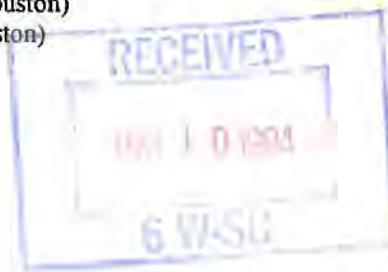
Sincerely,

ECO SOLUTIONS, INC.

Randy W. Ireland
Randy W. Ireland
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attachments
94004CV2.WPD



ECO Solutions, Inc.

**HOECHST CELANESE
CHEMICAL GROUP, INC.
Bay City Plant**

***WORKOVER AND
MECHANICAL INTEGRITY TESING
ON
WDW-49 (WELL NO. 4)***

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Job No. 94004



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1.0 INTRODUCTION AND EXECUTIVE SUMMARY

1.1 INTRODUCTION

Hoechst Celanese Chemical Group, Inc. (HCCG) contracted ECO Solutions, Inc. (ECO) to workover WDW-49 (Well No. 4) and perform pressure falloff and mechanical integrity testing at Hoechst Celanese Chemical Group's Bay City Plant in Matagorda County, Texas. Workover and mechanical integrity testing operations were supervised by ECO Solutions' Robert M. (Bob) Hall. Workover operations commenced on Thursday, March 3, 1994, and ended on Friday, March 11, 1994. Pressure falloff testing was supervised by ECO Solutions' Reuben L. Alaniz. Falloff testing commenced on Monday, March 14, 1994, and ended on Friday, March 18, 1994. Daily activities are detailed in Section 1.2.

The workover was conducted to replace the injection tubing due to a leak. The tubing was successfully replaced, and the well was placed back in service on Tuesday, March 8, 1994. Mechanical Integrity Testing (MIT) consisted of a Magnelog Casing Inspection Survey that was performed in conjunction with the workover. Annulus Pressure Tests (APT) and Radioactive Tracer (RAT) surveys were performed after completion of the workover. The MIT was successfully completed on Friday, March 11, 1994.

1.2 WORKOVER SUMMARY

The workover on WDW-49 commenced on Thursday, March 3, 1994, with the move in and rig up of Dawson-Welltech's workover rig. The 5 1/2" 20 pounds per foot (ppf) injection string was pulled from the well. Atlas Wireline was rigged up and a Magnelog casing inspection was run from 3,308' to the surface. No anomalies were noted during the Magnelog inspection run.

A seal assembly and workstring were run in the hole, stung into the packer, and the annulus filled with brine. Field operations conducted an annulus pressure test (APT) to 1,018 psig with a 2 7/8" workstring in the hole. Annulus pressure decreased only 10 psi in thirty (30) minutes. The workstring was pulled from the hole and the new 5 1/2" 20 ppf injection string was run in the hole.

After the new injection string was installed, an annulus pressure test was performed. During the first annulus pressure test, a leak was noted in the surface test equipment. The wellhead was installed, the annulus was pressured to 1,000 psig, and the wellhead was found to be leaking. The wellhead leak was repaired and the annulus pressured up to 1,006 psig. Annulus pressure decreased to 908 psig in thirty minutes on this third APT. The well was closed in for the night and allowed to stabilize.

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The following morning, the annulus was pressured up to 1012 psig, with a subsequent decrease to 900 psig in thirty minutes. The TNRCC inspector arrived on site and was informed of the test results. The formal test was aborted. On a final attempt, the annulus was repressured to 1,014 psig and decreased to 953 psig in thirty minutes.

The workover rig was rigged back up and the wellhead nipped down. The rig picked up the injection string, pulled the seal assembly out of the packer bore, rotated the injection string 1/2 rotation to the right, and reseated the packer. The same day, the annulus was pressured up to 1,014 psig and bled to 953 psi in thirty minutes. The well was closed in for the night and allowed to stabilize.

On Thursday, March 10, 1994 the annulus was again pressured up to 1,118 psig and monitored for 140 minutes. The pressure did not decrease during this period. The pressure was bled to 400 psig, then increased to 1,042 psig, and monitored for 90 minutes. No pressure losses were noted. WDW-49 successfully passed the APT on Thursday, March 10, 1994.

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2.0 DAILY ACTIVITIES

2.1 REPLACE INJECTION STRING

Thursday, March 3, 1994

All contractors attended HCCG safety orientation and site specific safety training. Laid down 8 mil plastic liner beneath workover rig. Spotted pump, tanks, and pipe racks. Moved in and rigged up Dawson-Welltech workover rig. Unloaded 20 barrels of 9.8 ppg brine from B&G Well Service. Unloaded workstring and miscellaneous rental equipment.

HCCG personnel measured remaining wall thickness on 5 1/2" 20 ppf, N-80 injection string exposed above the wellhead at 0.300" and checked around two (2) weld areas for potential cracks prior to picking up on injection string.

Removed threaded valve assembly from threaded socket weld on injection string in preparation of picking up string. Threads on socket weld were severely corroded. Decision made to wait until morning prior to picking up on injection string. Made contingency plans for potential "parting" of the injection tubing above the wellhead in either the threaded area or the pipe body.

Friday, March 4, 1994

Picked up on 5 1/2" injection string. String free to move in wellhead. Unscrewed wellhead and attempted to "strip" same off wellhead. Welded plate on 5 1/2" injection string prevented wellhead removal. HCCG personnel cut the plate off. Removal of wellhead exposed a circumference crack exposed in 5 1/2" injection tubing. Stripped off wellhead. HCCG welder welded bead beneath cracked area.

Picked up set of 5 1/2" slip type elevators and set same beneath welded bead. Picked up on injection string and pulled out of TIW "S" packer. Pulled one (1) joint of 5 1/2" injection tubing. Installed annular BOP. Rigged up Weatherford International casing tongs. Started out of the hole with 55 joints 5 1/2" injection tubing. Closed well in for night.

Saturday, March 5, 1994

Finished pulling out of hole with injection string and TIW seal assembly. Rigged down Weatherford International.

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Rigged up Western Atlas to run Magnelog Casing Inspection Survey. Went in hole with same to the top of the injection packer at 3,308' (logged depth). Pulled out of the hole logging. No anomalies noted. Rigged down and released Western Atlas.

Picked up test seal assembly and 2 7/8" PH-6 workstring. Went in hole with same. Stung into packer and filled annulus with brine. Closed well in until Monday, March 7, 1994

Monday, March 7, 1994

Pressure tested 7 5/8" protection casing to 1,018 psig. Pressure decreased 10 psi in thirty (30) minutes (0.33 psi/min). Test successful.

Pulled out of hole laying down 2 7/8" PH-6 workstring and test seal assembly. Unloaded 83 joints of new 5 1/2" 20 ppf, N-80 LT&C tubing.

Rigged up Weatherford International casing tongs and computerized thread makeup unit. Started in hole with redressed TIW "S" seal assembly (Chevron seals) and 49 joints of 5 1/2" tubing. Displaced annulus with 100 bbls of Halliburton Anhib inhibited brine prior to closing well in for night.

Tuesday, March 8, 1994

Finished in hole with 5 1/2" 20 ppf, N-80 LT&C injection string (79 joints total). Stung into "S" packer at 3,316' with 25,000# weight down on packer. See 5 1/2" injection tubing tally in Appendix A.

Pressure tested annulus to 1,000 psi for fifteen (15) minutes. Pressure decreased approximately 1 psi/minute with a small leak noted in the surface equipment. Texas Natural Resource Conservation Commission (TNRCC) allowable leakoff rate is 50 psi in 30 minutes (1.67 psi/min).

Rigged down Weatherford International and casing tools. Installed new wellhead. Rigged down workover rig and peripheral equipment and moved off location to make room for HCCG personnel working on wellhead. HCCG welder cut off extended section of 5 1/2" tubing exposed above the wellhead and welded on 5 1/2" 8 round threaded slip on weld nipple.

Pressure tested annulus to 1,000 psig. Wellhead leaking in lower thread area of 8 5/8" x 7 5/8" carbon steel adapter. Welded bead around same to stop leak. Repressurized annulus to 1,006 psig. Pressure decreased to 908 psi in 30 minutes (3.07 psi/min). Will allow well to stabilize overnight prior to retesting. Closed well in for night.

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Wednesday, March 9, 1994

Repressured annulus to 1,012 psig. Pressure decreased 112 psi to 900 psig in 30 minutes (3.73 psi/min). Notified Larry Walker upon arrival (TNRCC inspector) of annulus pressure test results. Aborted formal TNRCC annulus pressure test.

Repressured annulus to 1,108 psig. Pressure decreased 83 psi in 30 minutes (2.77 psi/min) to 1,025 psig. Discussed plan of action with HCCG personnel. Decision made to remove TIW seal assembly from "S" packer bore and allow the differential pressure/flow from the annulus to the tubing "wash" across the seals on the TIW seal assembly.

Rigged up workover rig. Nipped down wellhead and picked up injection string with 25,000# weight on packer. Pulled seal assembly out of packer bore, rotated the injection string 1/2 rotation to the right and reseated injection string with 20,000# weight down on packer. Nipped up wellhead.

Filled annulus with 8 bbls of inhibited brine. Repressured annulus to 1,014 psig. Pressure decreased 61 psi to 953 psi in 30 minutes (2.03 psi/min). Bled pressure to 100 psig. Closed well in for night.

Thursday, March 10, 1994

Repressured annulus to 1,118 psig, pressure decreased 0 psi over 140 minute period. Cycled annulus pressure - bled pressure to approximately 400 psig and then increased pressure back up to 1,042 psig. Pressure held at 1,042 psig over 90 minute period.

HCCG personnel connected the annulus pressure instrumentation and monitored the annulus pressure for several hours. No pressure decrease was noted during this time. Bled pressure to 550 psig. Closed well in for night.

Friday, March 11, 1994

Moved in and rigged up Atlas Wireline Services. Ran in hole to 3,433'. Ran Radioactive Tracer (RAT) Survey. Rigged down Atlas Wireline Services. Returned well to service.

2.2 PRESSURE FALLOFF TESTING

Tuesday, March 15, 1994

0700 Milton Cooke Wireline on location, check in with front gate. Spot equipment and begin rigging up on WDW-49 (Well #4).

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- 0815 Meet with Ray Horton, review test procedures and current injection conditions of all wells. WDW-110 (Well #1A) out of service on Friday, March 11, 1994. WDW- 14 (Well #2) out of service on Friday, February 18, 1994, and WDW- 32 (Well #3) out of service on Friday, March 11, 1994. WDW- 49 (Well #4) maintain constant rate on Friday, March 11, 1994.
- 1000 Review instructions with Milton Cooke for programming back-up memory gauge.
- 1045 Milton Cooke checking CCL and cable counter.
- 1210 Pressure up lubricator with Surface Read Out and Memory Gauge tool string. Prepare to go in hole.
- 1218 Going in hole with well injecting. Injection Rate is 162 gpm, and Surface Injection Pressure is 464 psig.
- 1310 Gauge at 3200 ft , begin logging with collar locator, tying into packer at 3316 ft.
- 1400 Having trouble with GRC data acquisition system.
- 1422 Set tool string at 3300 ft , waiting for new GRC acquisition system.
- 1715 Begin GRC Data Acquisition System with GRC EPG-520 gauge (S/N 69491).
- 1731 Pull gauge up hole and set at 3000 ft, monitor bottom hole injection pressure and temperature.
- 1800 Continue monitoring injection period. Injection Rate is 164 gpm, Down hole Injection Pressure is 1760 psia, and Surface Injection Pressure is 462 psig.

Wednesday, March 16, 1994

- 0700 Continue monitoring injection period. Injection Rate is 166 gpm, Down hole Injection Pressure is 1760 psia, and Surface Injection Pressure is 460 psig. Generated Cartesian curve to evaluate pressure stability. Prepared for falloff test.
- 1200 Rate and pressure increase, speak with operator for possible cause.
- 1300 Operator re-adjusting rate, possible trouble with motor valve.
- 2258 Still experiencing motor valve problems, causing rate and pressure fluctuations.

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Thursday, March 17, 1994

- 0600 Monitoring injection period. Injection Rate is 168 gpm, Down hole Injection Pressure is 1758 psia, and Surface Injection Pressure is 460 psig. Flow rate and bottom hole pressure stabilized. Prepare for falloff test.
- 0707 Injection Rate is 168 gpm, Down hole Injection Pressure is 1758 psia, and Surface Injection Pressure is 460 psig. Shut down Injection pump at Control room 1. Begin Falloff test.
- 1200 Monitoring falloff period. Down hole Shut-in Pressure is 1384 psia and Surface Shut-in Pressure is 90 psig.
- 1700 Continue monitoring falloff period. Down hole Shut-in Pressure is 1383 psia and Surface Shut-in Pressure is 88 psig.

Friday, March 18, 1994

- 0800 Generate Semi-Log and Log-Log curves for observation. Pressure derivative curve and semi-log curves indicates radial flow period has been obtained. End falloff test. Down hole Shut-in Pressure is 1381 psia, and Surface Shut-in Pressure is 80 psig.
- 0821 Drop tool 10 ft down hole. Begin pulling out of hole making static gradient stops.
- 1000 Gauges at surface, end of static gradient survey. Bleed down lubricator. Rig up weight bars and collar locator, go back in hole to tag bottom.
- 1030 Release WDW-110 (Well #1-A) over to plant for operation. Injection falloff test scheduled for March 21, 1994.
- 1105 Tag bottom at 3423 feet. Pull out of hole, rig down and move equipment over to WDW-110 (Well #1-A).

3.0 PRESSURE FALLOFF TESTING

3.1 PRESSURE FALLOFF TESTING

Pressure falloff testing commenced on Tuesday, March 15, 1994 and concluded on Friday, March 18, 1994. The flowing bottom hole pressure was monitored for a total of 37.87 hours followed by a 24.88 hour shut-in period. Plots and data for the test are included in Appendix E. The period of last shut-in was March 11 to 15, 1994 and a graphic presentation of injection versus days for this 95 hour period is included in Appendix E.

3.2 PRESSURE FALLOFF ANALYSIS

Method Of Interpretation: The following analysis was performed by utilizing both Semi-Log and Log-Log analysis. A) The *Semi-Log* curve was generated by plotting pressure vs. the superposition time function utilizing the given rate history. The semi-log straight line was then calculated by linear regression through the infinite acting flow period of the falloff curve. The semi-log slope and P_{1hr} values were obtained from the semi-log straight line and utilized for the final permeability and skin calculations. B) The *Log-Log* curves were generated by plotting Delta-P/Delta-Q and Pressure derivative vs. the Agarwal Equivalent time function. The Log-Log curves were simultaneously positioned over $[T_D/C_D]$ wellbore storage type-curves until a solution match was obtained. Permeability and skin values were calculated from this match and then compared with those obtained from the Semi-Log analysis.

- A. *Semi-Log (Superposition):* The straight line area of the semi-log curve was identified by first using the 1-1/2 log cycle rule to estimate the end of wellbore storage effects. Secondly, the time of the flat portion from the pressure derivative curve was used in determining the area of the semi-log curve in which the straight line was drawn. The semi-log straight line yielded a slope value of 5.5174 psi/cycle and a P_{1hr} of 1388 psi. The pressure difference between P_{1hr} and the injection pressure followed with the calculated slope give indications of positive skin damage and high permeability.
- B. *Log-Log ($[T_D/C_D]$ Wellbore storage Type-curves):* The high maximum of the derivative curve illustrates wellbore storage and positive skin effects. The flattening portion of the derivative indicating the infinite acting flow period of the curve was observed approximately 5.3 hours following the start time of the falloff period. The flat portion of the derivative curve was the main factor used to obtain a type curve match yielding similar results to the semi-log analysis.

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Conclusions: The system was diagnosed as a homogeneous reservoir with a calculated permeability of 1417 (md) and skin damage of +69.8 utilizing an h_{net} value of 85 feet. The flow efficiency of 12.3% suggests that the near wellbore condition impacts the injection volume limitations and the total pressure drop is primarily due to conditions within a small radius from the well.

The Following Table is provided to give comparative results with the previous test. The primary variables affecting the calculated results are included.

Date MM/YY	Rate GPM	h_{net} feet	U_w cp	Slope psi/cyl	kh/u md-ft	k md	S -
09/92	79.5	85	0.710	2.710	163,584	1366.4	+ 117.0
03/94	168.0	85	0.710	5.5174	169,620	1416.8	+ 69.8

The calculated results indicate a difference in transmissibility, (kh/u) of 3.6% and a difference in skin of 40.3% between the two tests. The decrease in skin could be contributed to the fact the well was inactive for several months and installation of a new injection string since the previous well test. The transmissibility and permeability values are fairly consistent between the two tests. The primary conclusion is there has been no significant change in reservoir conditions.

The time to exit the waste front was less than the start time of the infinite acting flow period. Therefore, the viscosity of the original reservoir fluid was used for the final analysis.

A homogeneous simulator was utilized to confirm the calculated results mentioned above. The main assumptions were as follows: 1) a single well with infinite acting and radial flow conditions, 2) injection at a constant rate, and 3) constant reservoir conditions such as porosity, permeability, and compressibility. Based on this particular reservoir the simulated data matched the actual data with a reasonable degree of accuracy. The program used for final analysis and well simulation was "PanSystem 2.1", marketed by Edinburgh Petroleum Services. Plots of the analysis using the "PanSystem 2.1" are included in Appendix E.

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Table 3.1 Falloff Test Data

<u>General Test Information</u>	
Date of Test	March 15 - 18, 1994
Cumulative injection (gals.)	1846.49×10^6 gallons
Wellbore radius (ft.)	0.458
Gross completed interval (ft.)	3372' -3579'
Type of completion	Slotted Screen Gravel Pack in Open Hole
Depth to fill	3423'
Justified interval thickness (ft.)	85'
Average historical waste fluid viscosity (cps)	0.5914 at 120 °F
Formation fluid viscosity (cps)	0.71 at 120 °F
Porosity (%)	33
Total compressibility (psi^{-1})	5.0×10^{-6}
Formation volume factor	1.0
Initial formation bottom hole pressure (psia)	1501 (1968) @ 3,300'
<u>Injection Period</u>	
Time of injection period (hrs.)	95
Injection rate (gallons per minute)	168
Test fluid	Waste Fluid
Pumps used for test	P61 Byron Jackson - Centrifugal
Injection fluid viscosity (cps)	0.5914 at 120 °F
Final injection pressure (psia)	1758.40
Final injection temperature (°F)	81.87
Gauge type	GRC EPG-520 Serial # 69491
Gauge resolution and calibration	0.01 psi
Gauge depth (feet)	3000
<u>Falloff Period</u>	
Total Shut-in Time (hrs.)	24.88
Final Shut-in Pressure (psia)	1380.76
Final Shut-in Temperature °F	97.52
Final Shut-in Tubing Pressure (psia)	80

ECO Solutions, Inc.*Environmental Engineering and Technical Services***Table 3.2 Analysis Results of Pressure Falloff Test**

	Log-Log Type Curve	Semi-Log Synthesis
kh/m (md-ft/cp)	201,217.5	203,636.0
Flow capacity (md-ft)	119,000	120,430.3
Permeability (md)	1,400	1,416.8
Skin effect	69	69.76
Dimensionless storage coefficient		0.06
p* (psia)	1,376.4347	1,377.2898

3.3 COMPARISON TO PETITION MODEL DATA

The reservoir properties (pressure, permeability, etc.) of the upper Miocene injection interval were determined through falloff testing conducted on WDW-49. The flowing or operational formation pressures from the tests can be compared with the modeled operational pressures by converting the measured pressures to a depth of 3440' below ground level and removing the pressure increase due to skin effect. A fluid gradient of 0.434 psi/ft was used to correct all pressures from the gauge depth of 3000' to 3440'. The formation pressures predicted by the model assume no formation damage effects or other near-wellbore conditions. The measured flowing pressures corrected for skin effects and maximum predicted operational pressures are presented in the Table below:

Formation Pressures

WDW-49 (Well 4) Depth	Flowing Formation Pressures, psi	Skin Pressure Loss, psi	Revised Formation Pressure, psi	Maximum Modeled Pressure, psi
3000'	1758	334	1424	NA
3440'	1949	334	1615	1640

The measured flowing pressure is below the maximum modeled operational pressure by 25 psi for WDW-49. A graph of the modeled pressures for WDW-49 is included. The graph shows the yearly predicted modeled injection rates (250 gpm for each well). All predicted operational pressures correspond to a depth of 3440' below ground level and an original estimated formation pressure for the upper Miocene injection interval of 1555 psi.

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The measured static formation pressures from the well tests, corrected to a depth of 3440' below ground level, show a formation pressure increase of 17 psi. This illustrates that injection operations at the plant have had limited impact on formation pressures and should continue to have limited impact on formation pressures in the future.

Static Formation Pressures From WDW-49 Well Test

Original Estimated Formation Pressure at 3440'	Static Formation Pressure at 3440'	Formation Pressure Increase, psi
1555	1572	+17

A comparison of the test permeability and transmissivity values with the modeled values of permeability and transmissivity for WDW-49 are given below:

Well Name	Test Permeability, md	Petition Permeability, md	Test Transmissivity, md-ft/cp	Petition Transmissivity, md-ft/cp
WDW-49 (Well 4)	1417	1350	169,620	313,700

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4.0 MECHANICAL INTEGRITY TESTING

4.1 MAGNELOG CASING INSPECTION SURVEY

LOG DATA

Date Run:	Saturday, March 5, 1994
Logging Service Company:	Atlas Wireline Services
Surface Casing Size and Depth Set:	10-3/4" 32.75# H-40 set at 1389'
Casing Size and Depth Set:	7-5/8" 26.4# K-55 set at 3306'
Top of logged interval:	20'
Bottom logged interval:	3302'
Copy of Log:	Included as Appendix B
Interpretation By Atlas Wireline Services:	In Appendix B

Two tracks are included on the Magnelog presentation: (1) Casing Collar locator (CCL) in the left track, and (2) Phase shift on the right track. The CCL and Phase shift logs are the primary interpretive curves reviewed in this evaluation. Phase shifts to the right indicate heavier weight or higher grade casing. Phase shifts to the left indicate lower weight or lower grade casing. The two pronged (double) kick to the right on the phase shift curve generally indicates casing collars (if confirmed by the CCL), centralizers, or other external cementing tools welded to the outside of the casing.

It is important to note that concentric strings of casing disrupt the induced magnetic field response displayed by the phase shift curve. The phase shift curve is generally shifted to the right due to the extra metal surrounding the casing being logged. The concentric casing phase shift on WDW-49 extends from the surface to 1390', or almost exactly where the 10-3/4" 32.75# H-40 is set at 1389'. Magnelog interpretation above 1390' is not really meaningful due to the interference of the surface casing.

The phase shift curve is initially calibrated inside the 7-5/8" 26.4 lb casing with known internal diameter (ID) of 6.969". The repeat section from 3076' to 3326' (250') is assumed to be relatively consistent pipe with an average 6.969" ID. The average phase indicated on the Magnelog over the repeat section is about 137° (Roughly 3-2/5 divisions from the left).

There is apparently one external centralizer located at 3281' to 3285' (4' long). There are five relatively higher weight or grade joints from 1390' to 3302'. These higher weight or grade joints are located at 1785' to 1828' (43'), 1870' to 1913' (43'), two at 2420' to 2461' (41'), and 2461' to 2504'

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(43'), and a fifth joint from 2590' to 2630' (40'). There were no joints that appeared to be of exceptionally lower weight or grade pipe. Aside from these minor points of low significance, there are no indications of any casing splits, parts, holes, or major corrosion points.

The CCL log shows 78 joints of casing from 30' to 3308'. The joints are of relatively consistent length, averaging 42.03 feet per joint. The low variation in average length is an indicator of higher quality casing in the well. Another indicator of potentially high quality seamless casing is the apparent angle of individual joint phase shifts over the length of the joints. This implies a slightly tapered OD throughout the length of the joint. Seamless casing has a tapered OD because of the manufacturing process of piercing a super heated solid steel bar with a rotating mandrel. The end the mandrel starts from will generally have a smaller ID than the far end where the point of the mandrel protrudes from the bar stock being forged into seamless pipe. This is because the unsupported far end of the mandrel is subject to slight vibration. In summary there is no indication of any casing integrity problems from any of the Magnelog traces.

4.2 ANNULUS PRESSURE TEST

Annulus pressure testing was conducted on Thursday, March 10, 1994. The annulus was pressured up to 1042 psig and monitored for ninety (90) minutes. No pressure loss was noted during the ninety minute period. Annulus Pressure Test data and plots are included in Appendix C.

4.3 RADIOACTIVE TRACER SURVEY

LOG DATA

Date Run:	March 11, 1994
Logging Service Company:	Western Atlas International
Tubing Size:	5 1/2" 20 ppf N-80 carbon steel
Packer Depth:	3316' to 3322' (log measured depth)
Casing Size and Depth Set:	7 5/8" 26.4 lb./ft at 3306' and 3 joints Schedule 40 316 SS set at 3368'
Slotted Screen Liner size, length and depth:	4 1/2" 316 Schedule 40 SS (0.020" screen) set from 3371.5' to 3579'
Plugged Back Total Depth (PBTD):	3433' Top of fill
Copy Of Log:	Included as Appendix D
Interpretation By Atlas Wireline Services:	In Appendix D

Major observations from the RAT log evaluation are as follows:

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1. Passes #1, #2, #3, and #4 on both slug shots one and two have approximately the same area under their curves, and are simply spreading out due to repeated passes with the GR tool. The slug travels roughly the same distance between each of these four passes.
2. There appears to be downward fluid movement below 3433' because of the flattened shape of the RAT slug curve on both passes #5. This would indicate some of the injection interval below 3433' is accepting injection fluid.
3. The screen is at least partially plugged off to at least 3416', and possibly as deep as 3433', because passes #6 and #7 on both slug shots turn around and travel back upwards. This indicates injection fluid is being dispersed across the open screened injection zone from 3433' up to at least 3410'.
4. The After Injection Background API GR Pass (File 25) compared to the Background API GR Log Before Injection indicates no upward fluid movement above the top of the completion interval at 3371.5'. The After Injection Background API GR Pass shows that all RA slug traces have completely disappeared.

There is no indication of behind pipe upward fluid movement above the top of the permitted interval at 3350'. Wellbore fill at 3433', and potential slotted screen plugging 3416', tend to confirm the high near wellbore damage indicated by the high skin effect of +69 calculated in the falloff testing portion of this report. The following Table 4.1 is a summarizes the RAT log testing program.

Table 4.1 - Radioactive Tracer Log Data Table

Run No.	Start Time	File No.	Depth From	Depth To	Inject Rate	Peak Depth	Comments	Slug Travel	Pass Travel
1	11:25:53	1	3,136	3,427	0		Background API GR log before injection		
2	11:52:38	2	3,000	3,433	0		Background GR No. 1 - Top of fill at 3,433'		
3	12:12:28	3	3,001	3,433	0		Background GR No. 2		
4		8	3,002	3,097	10	3,050	Pass 1 - Chase #1 released at 3,000'	50	50
5		9	3,028	3,198	10	3,128	Pass 2 - In 5-1/2" 20# tubing	128	78
6		10	3,102	3,298	10	3,232	Pass 3 - In tubing	232	104
7		11	3,202	3,397	10	3,330	Pass 4 - TIW packer @ 3,316'	330	98
8		12	3,290	3,438	10	3,433	Pass 5 - SS Screen set 3,371.5' to 3,579'	433	103
9		13	3,320	3,428	10	3,423	Pass 6 - Slug turned around and coming back up in permitted completion interval.	423	-10
10		14	3,000	3,428	10	3,411	Pass 7 - Possible plugged screen from 3,317.5' to 3,433'	411	-12

ECO Solutions, Inc.*Environmental Engineering and Technical Services*

11		15	2,997	3,147	10	3,060	Pass 1 - Chase #2 released at 3,000'	60	
12		16	3,044	3,197	10	3,135	Pass 2 - In 5-1/2" 20# tubing	135	75
13		17	3,109	3,298	10	3,219	Pass 3 - In tubing	219	84
14		18	3,190	3,399	10	3,317	Pass 4 - Slug at packer	317	98
15		19	3,280	3,427	10	3,415	Pass 5 - Still moving down inside SS screen	415	98
16		20	3,361	3,428	10	3,416	Pass 6 - Still moving down inside SS screen	416	1
17		21	3,340	3,427	10	3,410	Pass 7 - Slug turned around and coming back up in permitted completion interval.	410	-6
18	13:51:33	22	3,348		120		Stationary reading #1 - When injection rate changed from 10 to 120 gpm, the ejector leaked RA slug which was detected by the bottom detector.		
19	14:07:10	23	3,348		120		Stationary reading #2		
20	14:23:02	24	3,358		120		Stationary reading #3		
21	14:41:21	25	2,906	3,427	0		After injection background GR pass		

ECO Solutions, Inc.

Environmental Engineering and Technical Services

APPENDIX A - TUBING TALLY

WDW-49 Tubing Tally (March 4, 1994)
5 1/2" N-80 20# LTC Injection Tubing Strap

Joint No.	Length	Joint No.	Length	Joint No.	Length	
1	42.57	11	42.51	21	42.53	
2	42.54	12	42.55	22	42.57	
3	42.62	13	42.45	23	42.55	
4	42.95	14	42.53	24	42.00	
5	42.42	15	42.70	25	42.45	
6	42.50	16	42.55	26	42.58	
7	38.12	17	42.48	27	42.50	
8	42.42	18	42.47	28	42.48	
9	42.54	19	42.55	29	40.50	
10	42.55	20	42.52	30	37.95	
Totals	421.23		425.31		418.11	1,264.65
31	42.50	41	42.60	51	38.61	
32	42.40	42	42.50	52	42.48	
33	39.65	43	42.43	53	42.40	
34	42.40	44	42.50	54	42.48	
35	42.45	45	42.35	55	42.45	
36	42.50	46	42.35	56	42.60	
37	42.45	47	42.40	57	42.61	
38	42.55	48	42.40	58	42.60	
39	42.35	49	42.40	59	42.50	
40	42.45	50	42.55	60	42.55	
Totals	421.70		424.48		421.28	1,267.46
61	42.40	71	42.38	80	36.9	
62	39.00	72	40.70	81	42.54	
63	42.44	73	42.51	82	41.8	
64	39.00	74	42.55	83	42.58	
65	42.48	75	42.32			
66	42.48	76	42.48			
67	42.58	77	42.62			
68	42.50	78	42.58			
69	42.40	79	38.70			
70	42.61					
Totals	417.89		376.84		163.82	958.55
Totals	839.12		847.01		839.39	3,490.66
Column	Length	Set Depth		Average Joint Length:		42.11
1 to 10	421.23	421.23				
11 to 20	425.31	846.54		Extra Joints		
21 to 30	418.11	1,264.65		80 to 83		163.82
31 to 40	421.70	1,686.35				
41 to 50	424.48	2,110.83				
51 to 60	421.28	2,532.11				
61 to 70	417.89	2,950.00				
71 to 79	376.84	3,326.84				

TBGTALLY.XLS

J.A.M SERVICES REPORT

COLOR	RED	WHITE	BLUE
SIZE	5 1/2		
THREAD	LTC		
WEIGHT	20#		
GRADE	N-80		
MAX TQ	5350		
OPT TQ	4280		
MIN TQ	3210		
REF TQ	450		
MAX TNS	5		
MIN TNS	0		
MAX SHLDR	0		
MIN SHLDR	0		
END RAN	73		
FOOTAGE	2050		
BACK OUTS	0		
REJECTS	0		

A.M SERVICES REPORT

Company #: ECO SOLUTIONS
Service Market Number: 721483
Marketing T.D. Number: LAF-361
Address: HORCHOT CELANESE
Model Number: 4
Job Name: WELL TECH #14
Tung Model: W/FORD 7-625 W/UKBU
Field / Stock: CELANESE PLANT
Customer Representative: MR. BOB HALL
Rope Condition: NEW
Thread Lock Part: API-MODIFIED
Computer #1: LV-2, 093
Computer #2: LV-2, 098
Technician #1: TONY UDDEVICH
Technician #2: BRIAN VIDRINE
Torque information supplied by: WEATHERFORD JAM DEPT.

J.A.M SERVICES REPORT

Time Summary:

The following is a summary of the time spent on this job.

Departed Weatherford service point @ 17:00 (03-06-94) .

Arrived at the location / rig @ 23:59 (03-06-94) .

Started running pipe @ 14:30 (03-07-94) .

Finished running pipe @ 09:30 (03-08-94) .

Departed the location / rig @ 11:00 (03-08-94) .

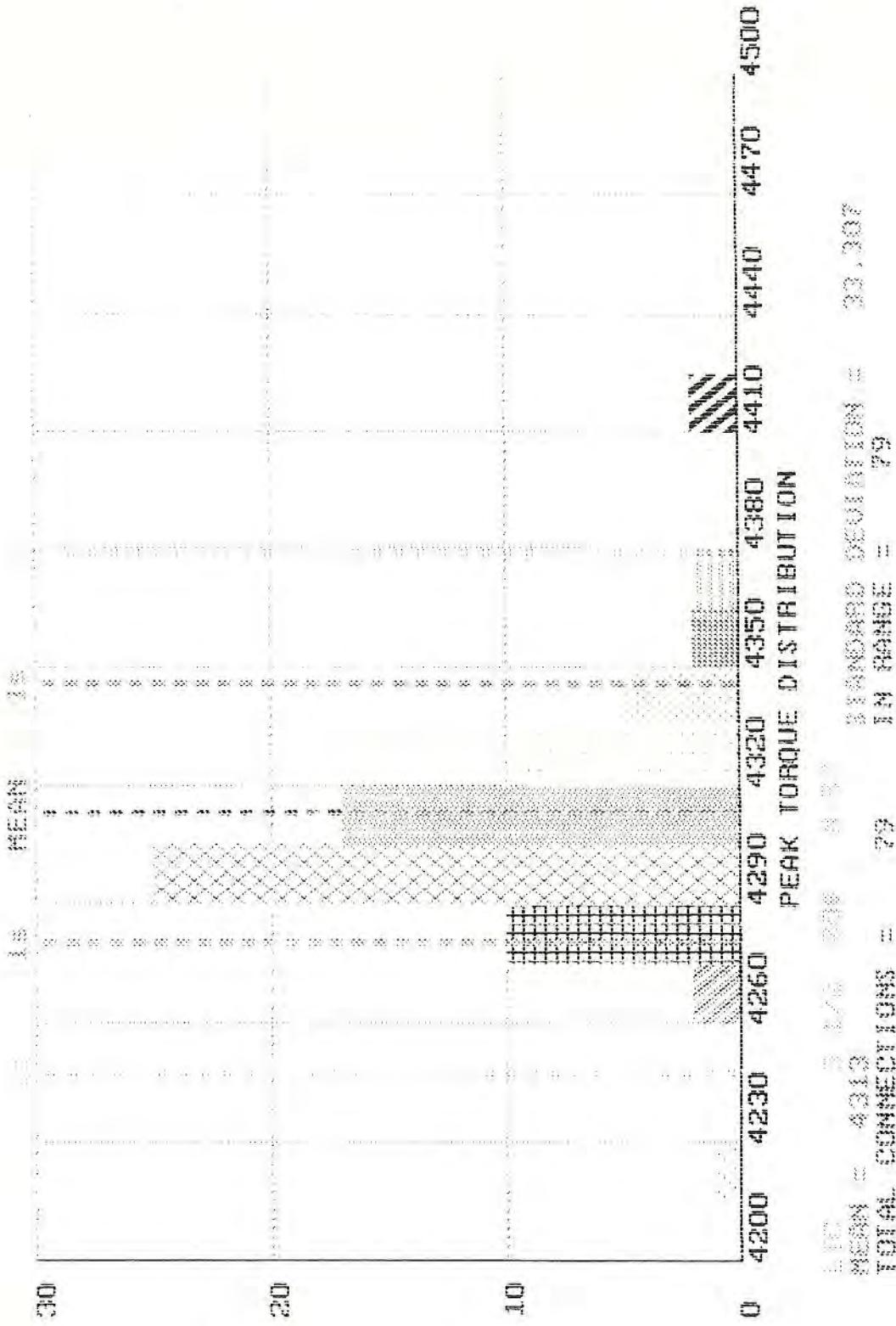
Returned to the Weatherford service point @ 18:00 (03-08-94).

Remarks:

Job went well, there was no downtime due to Weatherford equipment.

All connections were coped on the floor with API-Modified dope. This string of pipe made up with a consistent thread engagement recorded, using API torques and running procedures.

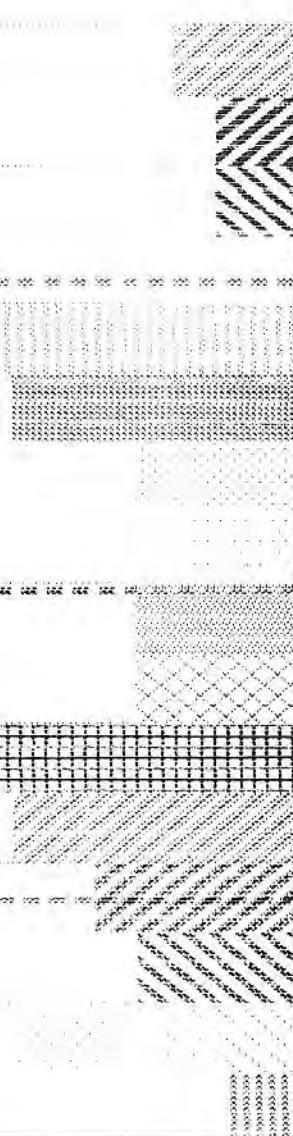
Weatherford experienced no accidents of any kind on this job. If you have any questions regarding this job or any other job, please do not hesitate to call us. Thank you very much for the work.



1916 = DENSEST LINES = 3,688
1917 = DENSEST LINES = 3,693
1918 = DENSEST LINES = 3,699
1919 = DENSEST LINES = 3,703
1920 = DENSEST LINES = 3,707
1921 = DENSEST LINES = 3,711
1922 = DENSEST LINES = 3,715
1923 = DENSEST LINES = 3,719
1924 = DENSEST LINES = 3,723
1925 = DENSEST LINES = 3,727
1926 = DENSEST LINES = 3,731
1927 = DENSEST LINES = 3,735
1928 = DENSEST LINES = 3,739
1929 = DENSEST LINES = 3,743
1930 = DENSEST LINES = 3,747
1931 = DENSEST LINES = 3,751
1932 = DENSEST LINES = 3,755
1933 = DENSEST LINES = 3,759

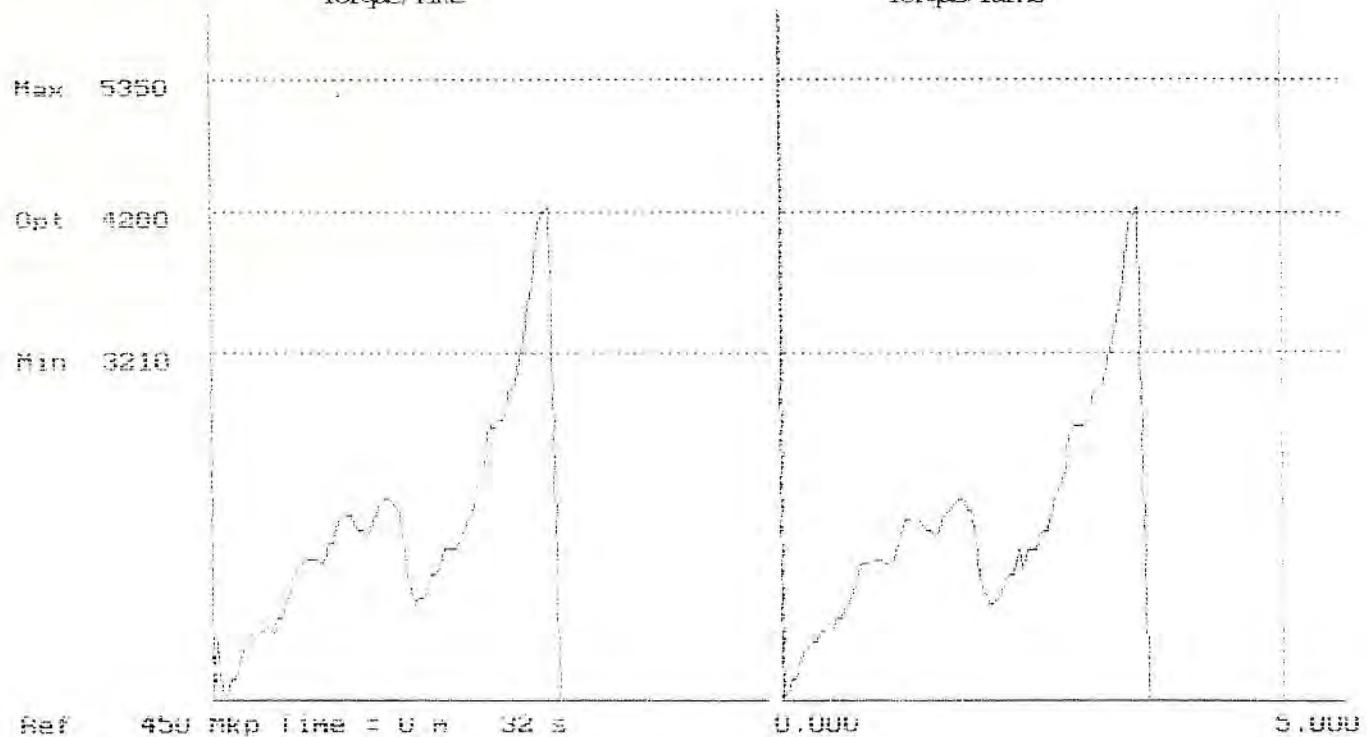
(0) 2,500 2,800 3,100 3,400 3,700 4,000 4,300 4,600 4,900 5,200 5,500

TOP TURNS DISTRIBUTION



WEATHERFORD JAM SERVICES

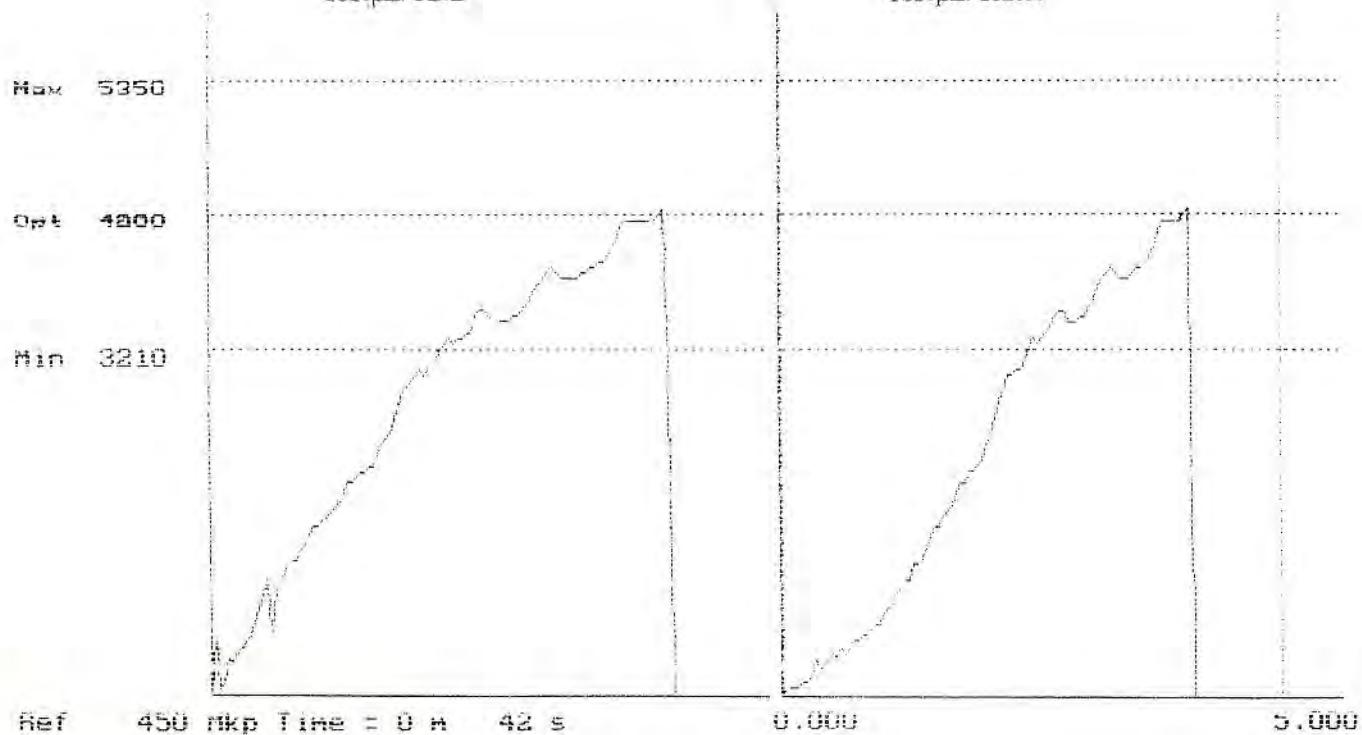
14:46 03/07/94 ACCEPT Joint # = 1 Log # = 1 Red String IIC 5 1/2 20# N=80
 Torque/Time Torque/Turns



Applied Torque = 4325 Top Turns = 3.575

Comments:OK BV, JOINT TO SEALS...

15:00 03/07/94 ACCEPT Joint # = 2 Log # = 2 Red String IIC 5 1/2 20# N=80
 Torque/Time Torque/Turns



Applied Torque = 4298 Top Turns = 4.077

Comments:OK BV

WEATHERFORD JAM SERVICES

15:04 03/07/94 ACCEPT Joint # = 3 Log # = 3 Red String LFC 5 1/2 20# N-80
 Torque/Time Torque/Turns

Max 5350

Opt 4200

Min 3210

Ref 450 Rkp Time = 0 hr 49 s

0.000

5.000

Applied Torque = 4298 Top Turns = 5.415

Comments:OK TU

15:09 03/07/94 ACCEPT Joint # = 4 Log # = 4 Red String LFC 5 1/2 20# N-80
 Torque/Time Torque/Turns

Max 5350

Opt 4200

Min 3210

Ref 450 Rkp Time = 0 hr 48 s

0.000

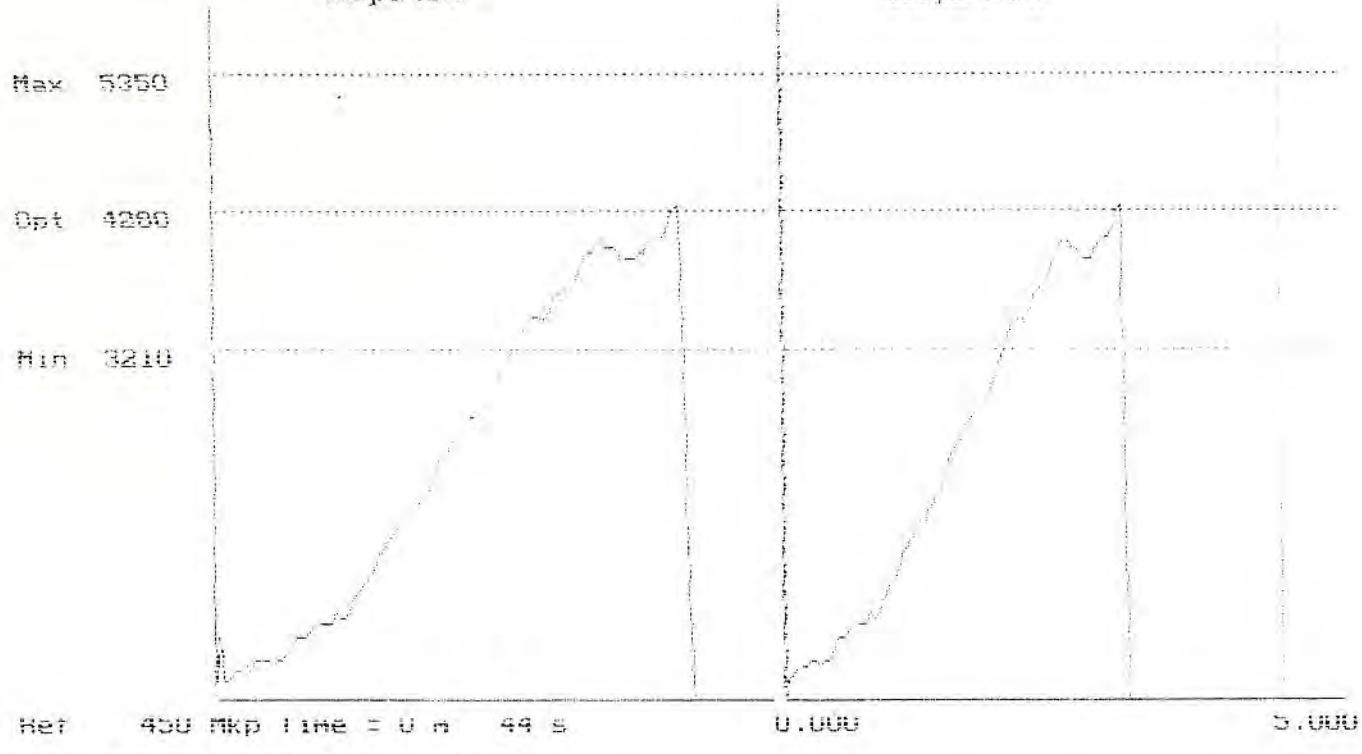
5.000

Applied Torque = 4218 Top Turns = 5.721

Comments:OK TU

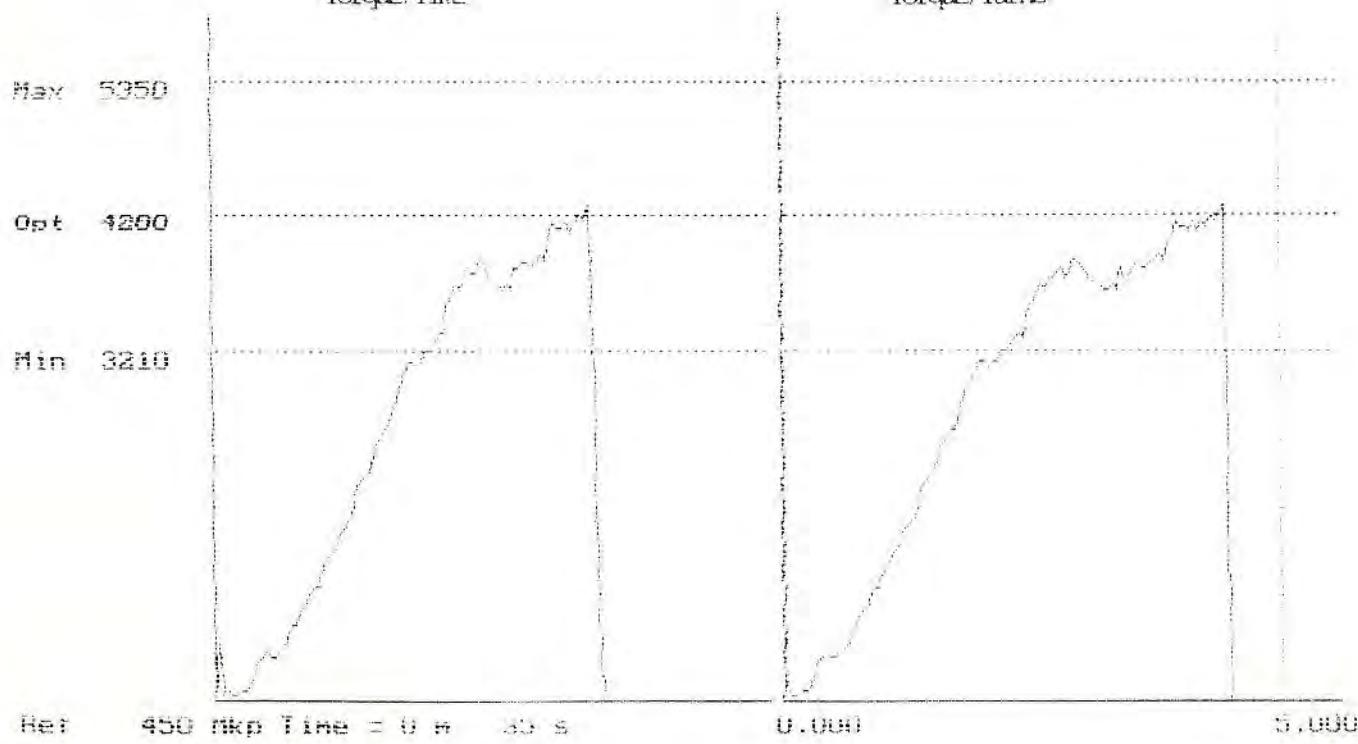
WEATHERFORD JAM SERVICES

15:15 03/07/94 ACCEPT Joint # = 5 Log # = 5 Red String LTC 5 1/2 20# N-80
 Torque/Time Torque/Turns



Comments:OK TU

15:19 03/07/94 ACCEPT Joint # = 6 Log # = 6 Red String LTC 5 1/2 20# N-80
 Torque/Time Torque/Turns



Applied Torque = 4345 Top Turns = 4.411

Comments:OK TU

WEATHERFORD JAM SERVICES

15:22 03/07/94 ACCEPT Joint # = 7 Log # = 7 Red String L1C 5 1/2 20# N-80
Torque/Time Torque/Turns

Max 5350

Opt 4200

Min 3210

Ref 430 Rkp Time = 0.8 39.5

0.000

5.000

Applied Torque = 4312 Top Turns = 3.043

Comments:OK TU

15:25 03/07/94 ACCEPT Joint # = 8 Log # = 8 Red String L1C 5 1/2 20# N-80
Torque/Time Torque/Turns

Max 5350

Opt 4200

Min 3210

Ref 430 Rkp Time = 0.8 39.5

0.000

5.000

Applied Torque = 4312 Top Turns = 4.293

Comments:OK TU

WEATHERFORD JAM SERVICES

15:29 03/07/94 ACCEPT Joint # = 9 Log # = 9 Red String LIC 5 1/2 20# N-80
 Torque/Time Torque/Turns

Max 5350

Opt 4280

Min 3210

Ref 450 Mkp Time = 0 m 20 s

0.000

5.000

Applied Torque = 4385 Top Turns = 2.749

Comments:OK TU

15:32 03/07/94 ACCEPT Joint # = 10 Log # = 10 Red String LIC 5 1/2 20# N-80
 Torque/Time Torque/Turns

Max 5350

Opt 4280

Min 3210

Ref 450 Mkp Time = 0 m 29 s

0.000

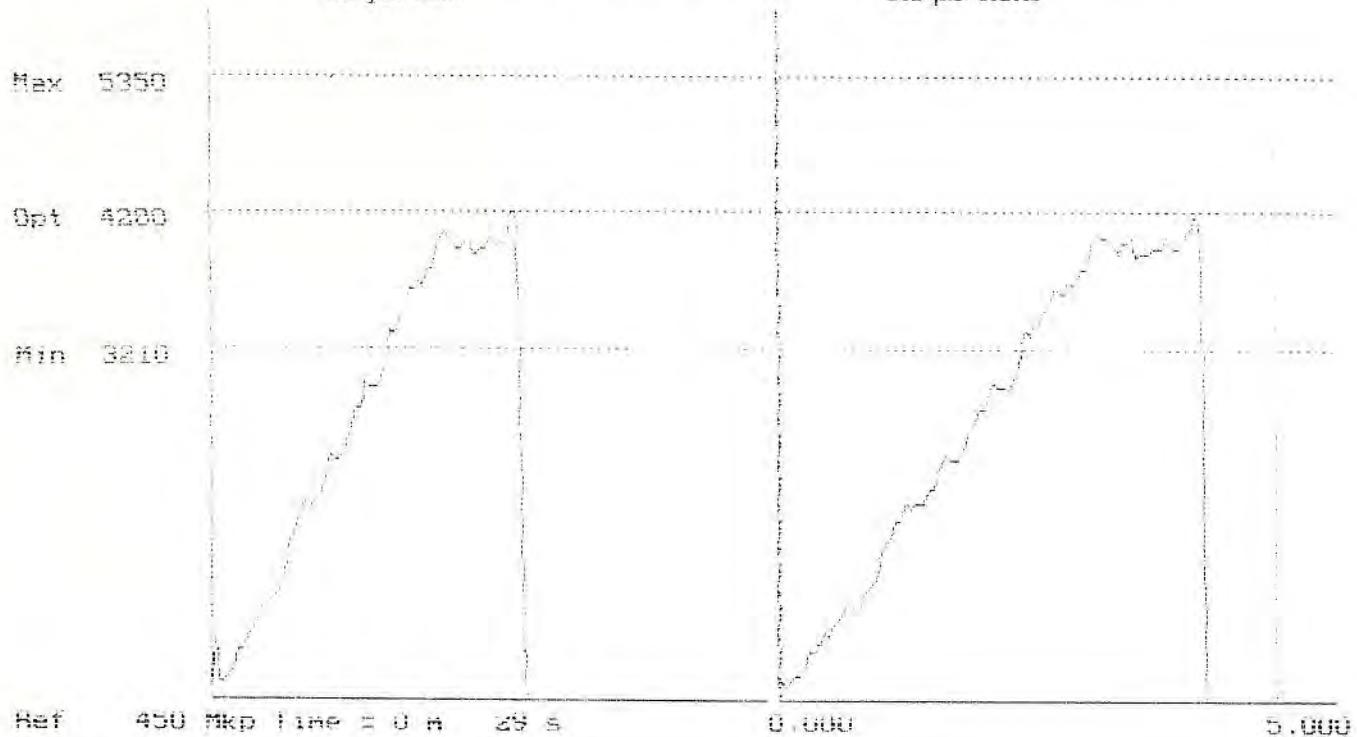
5.000

Applied Torque = 4305 Top Turns = 4.256

Comments:OK TU

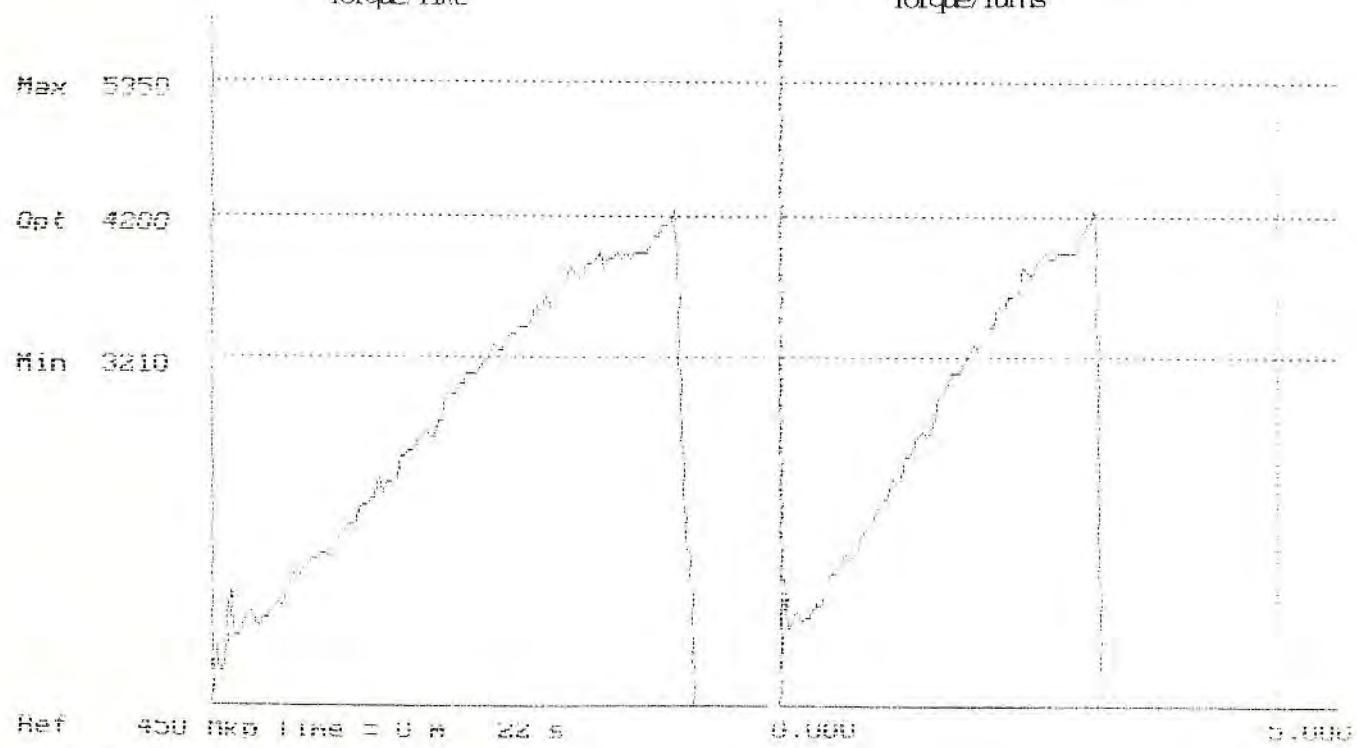
WEATHERFORD JAM SERVICES

15:36 03/07/94 ACCEPT Joint # = 11 Log # = 11 Red String LTC 5 1/2 20# N=80
 Torque/Time Torque/Turns



Comments:OK TU

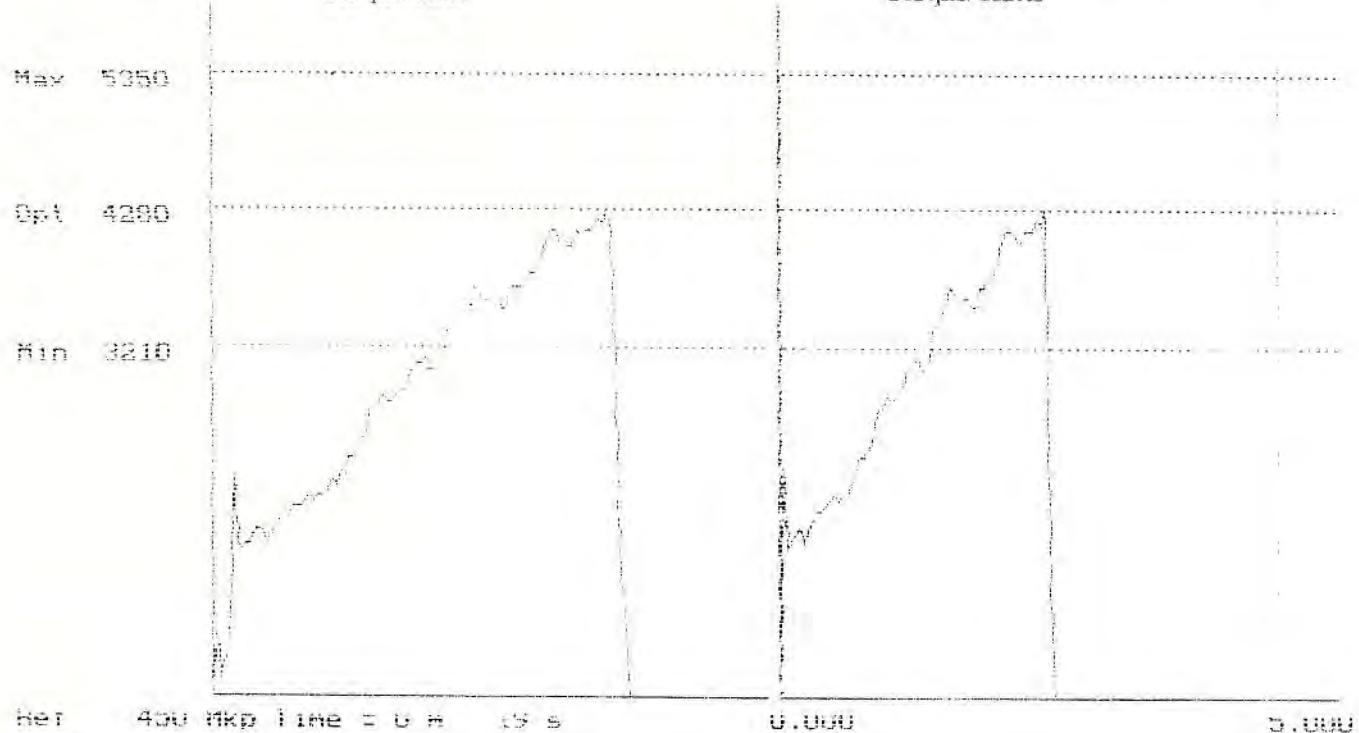
15:40 03/07/94 ACCEPT Joint # = 12 Log # = 12 Red String LTC 5 1/2 20# N=80
 Torque/Time Torque/Turns



Comments:OK TU

WEATHERFORD JAM SERVICES

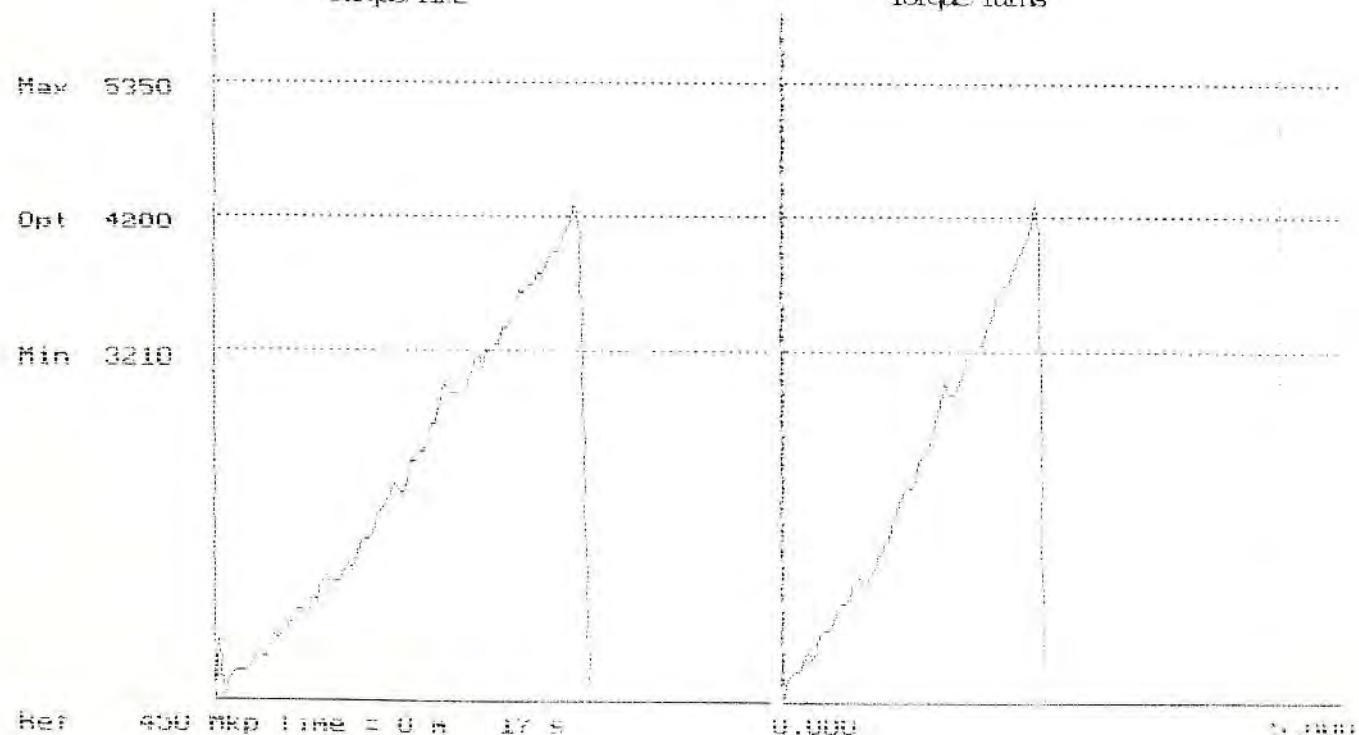
15:46 03/07/94 ACCEPT Joint # = 13 Log # = 13 Red String LTC 5 1/2 20# N-80
Torque/Tire Torque/Turns



Applied Torque = 4292 Top Turns = 2.668

Comments:OK BV, LATE SHIFT

15:49 03/07/94 ACCEPT Joint # = 14 Log # = 14 Red String LTC 5 1/2 20# N-80
Torque/Tire Torque/Turns



Applied Torque = 4412 Top Turns = 2.542

Comments:OK BV

WEATHERFORD JAM SERVICES

15:53 03/07/94 ACCEPT Joint # = 15 Log # = 15 Red String LTC 5 1/2 20# N-80
 Torque/Time Torque/Turns

Max 5350

Opt 4280

Min 3210

Ref 450 Mkp Time = 0 hr 36 s

Applied Torque = 4385 Top Turns = 4.449

Comments:OK BV

15:56 03/07/94 ACCEPT Joint # = 16 Log # = 16 Red String LTC 5 1/2 20# N-80
 Torque/Time Torque/Turns

Max 5350

Opt 4280

Min 3210

Ref 450 Mkp Time = 0 hr 25 s

Applied Torque = 4298 Top Turns = 3.769

Comments:OK BV

WEATHERFORD JAM SERVICES

15:59 03/07/94 ACCEPT Joint # = 17 Log # = 17 Red String LHC 5 1/2 20# N=80
 Torque/Time Torque/Turns

Max 5350

Opt 4200

Min 3210

Ref 450 mfp Time = 0.8 19 s

0.000 3.000

Applied Torque = 4378 Top Turns = 2.932

Comments:OK BV

16:03 03/07/94 ACCEPT Joint # = 18 Log # = 18 Red String LHC 5 1/2 20# N=80
 Torque/Time Torque/Turns

Max 5350

Opt 4200

Min 3210

Ref 450 mfp Time = 0.8 24 s

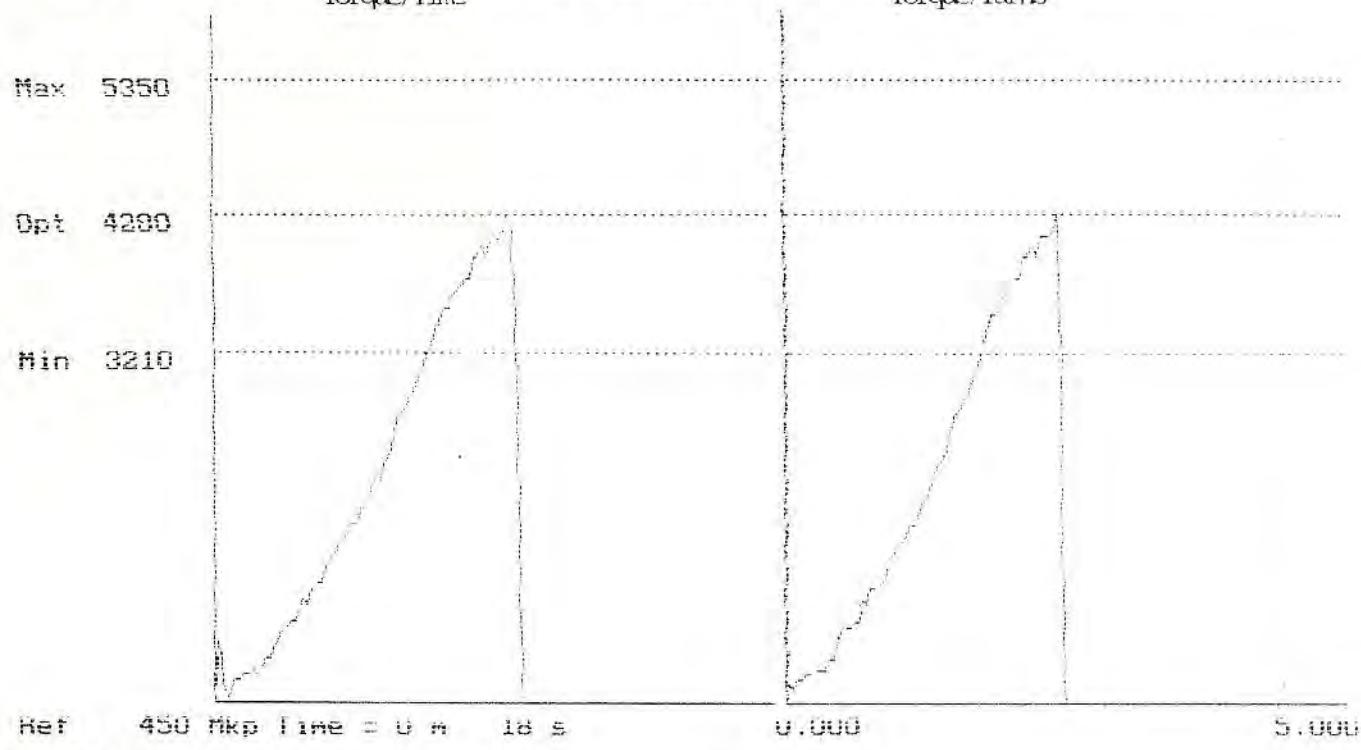
0.000 5.000

Applied Torque = 4298 Top Turns = 3.664

Comments:OK BV

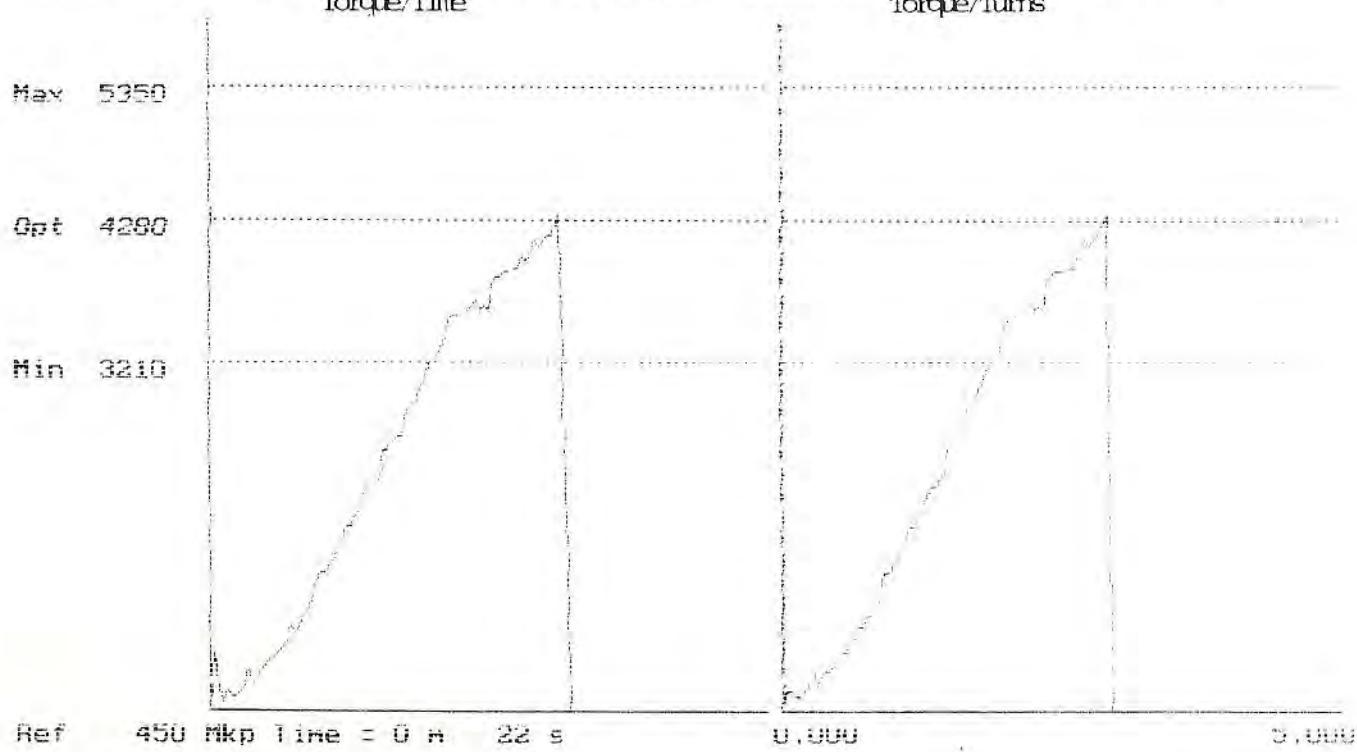
WEATHERFORD JAM SERVICES

16:06 03/07/94 ACCEPT Joint # = 19 Log # = 19 Red String LLC 5 1/2 20# N-80
 Torque/Time Torque/Turns



Comments:OK BV

16:09 03/07/94 ACCEPT Joint # = 20 Log # = 20 Red String LLC 5 1/2 20# N-80
 Torque/Time Torque/Turns



Applied Torque = 4318 Top Turns = 3.255

Comments:OK BV

WEATHERFORD JAM SERVICES

16:12 03/07/94 ACCEPT Joint # = 21 Log # = 21 Red String LRC 5 1/2 20# N-80
 Torque/Time Torque/Turns

Max 5350

Opt 4200

Min 3210

Ref 450 Mkp Time = 0 h 28 s

0.000

5.000

Applied Torque = 4345 Top Turns = 4.234

Comments:OK BV

16:16 03/07/94 ACCEPT Joint # = 22 Log # = 22 Red String LRC 5 1/2 20# N-80
 Torque/Time Torque/Turns

Max 5350

Opt 4200

Min 3210

Ref 450 Mkp Time = 0 h 28 s

0.000

5.000

Applied Torque = 4298 Top Turns = 4.157

Comments:OK TU

WEATHERFORD JAM SERVICES

16:20 03/07/94 ACCEPT Joint # = 23 Log # = 23 Red String LJC 5 1/2 20# N=80
 Torque/Time Torque/Turns

Max 5350

Opt 4280

Min 3210

Ref 450 Mkp Time = 0 h 21 s

0.000

5.000

Applied Torque = 4412 Top Turns = 3.187

Comments:OK TU

16:23 03/07/94 ACCEPT Joint # = 24 Log # = 24 Red String LJC 5 1/2 20# N=80
 Torque/Time Torque/Turns

Max 5350

Opt 4280

Min 3210

Ref 450 Mkp Time = 0 h 22 s

0.000

5.000

Applied Torque = 4292 Top Turns = 3.314

Comments:OK TU

WEATHERFORD JAM SERVICES

16:26 03/07/94 ACCEPT Joint # = 25 Log # = 25 Red String EIC 5 1/2 20# N=80
 Torque/Time Torque/Turns

Max 5350

Opt 4200

Min 3210

Ref 450 Rkp Time = 0 s 22 s

0 .000 3 .000

Applied Torque = 4292 Top Turns = 3.315

Comments:OK TU

16:29 03/07/94 ACCEPT Joint # = 26 Log # = 26 Red String EIC 5 1/2 20# N=80
 Torque/Time Torque/Turns

Max 5350

Opt 4200

Min 3210

Ref 450 Rkp Time = 0 s 21 s

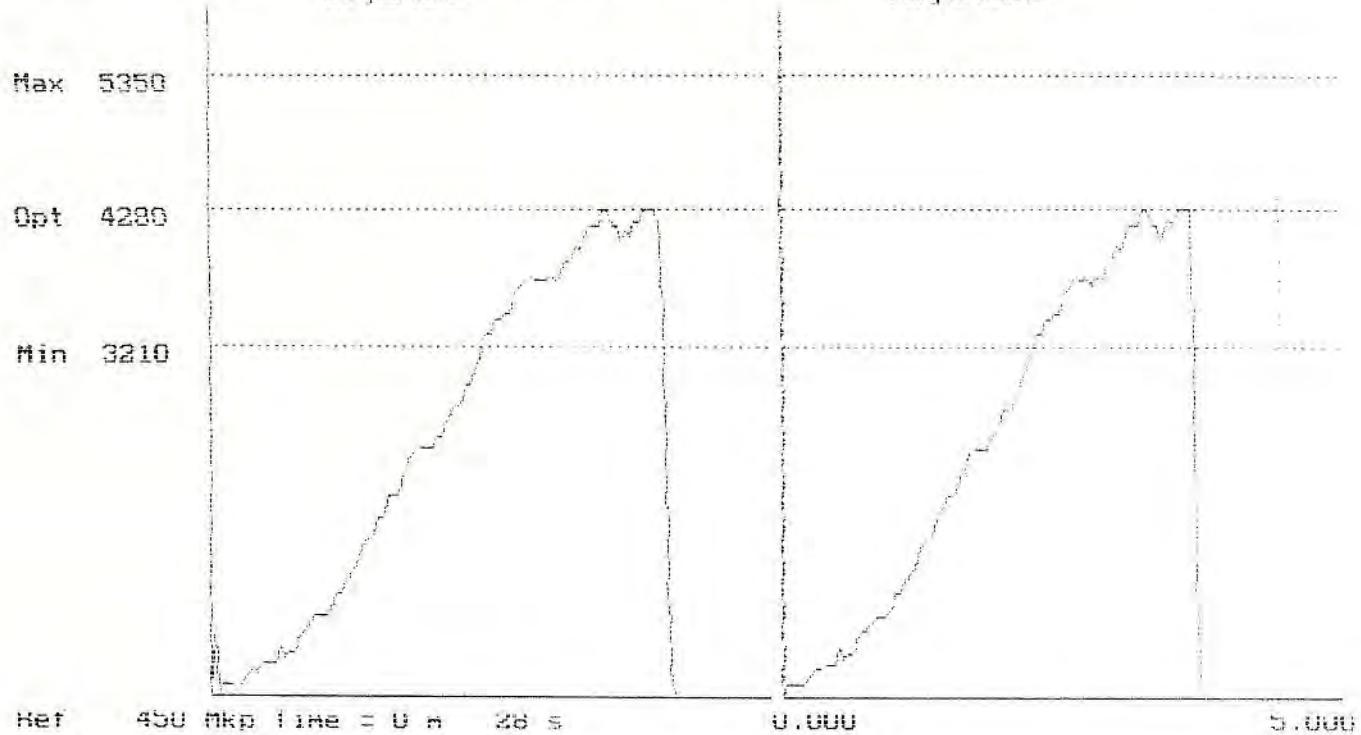
0 .000 3 .000

Applied Torque = 4312 Top Turns = 3.097

Comments:OK TU

WEATHERFORD JAM SERVICES

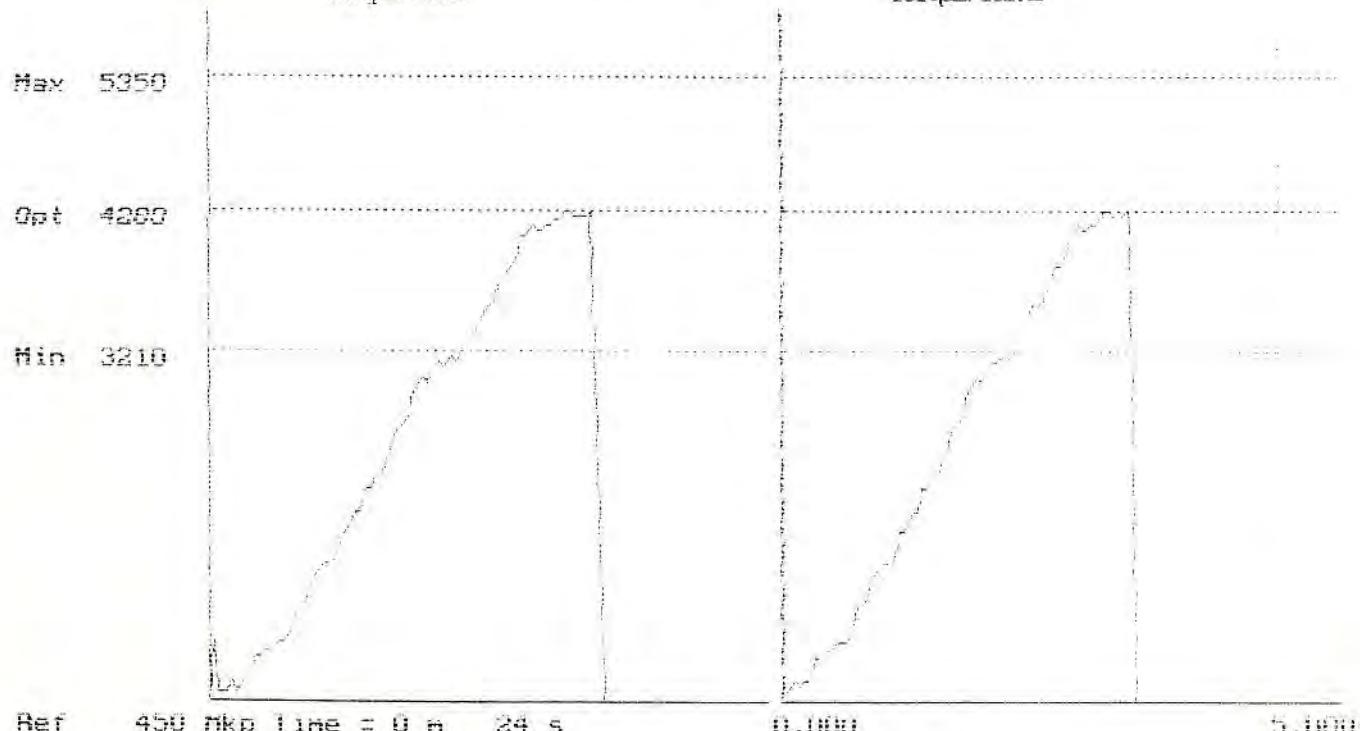
16:33 03/07/94 ACCEPT Joint # = 27 Log # = 27 Red String LFC 5 1/2 20# N-80
 Torque/Time Torque/Turns



Applied Torque = 4292 Top Turns = 4.131

Comments:OK TU

16:36 03/07/94 ACCEPT Joint # = 28 Log # = 28 Red String LFC 5 1/2 20# N-80
 Torque/Time Torque/Turns

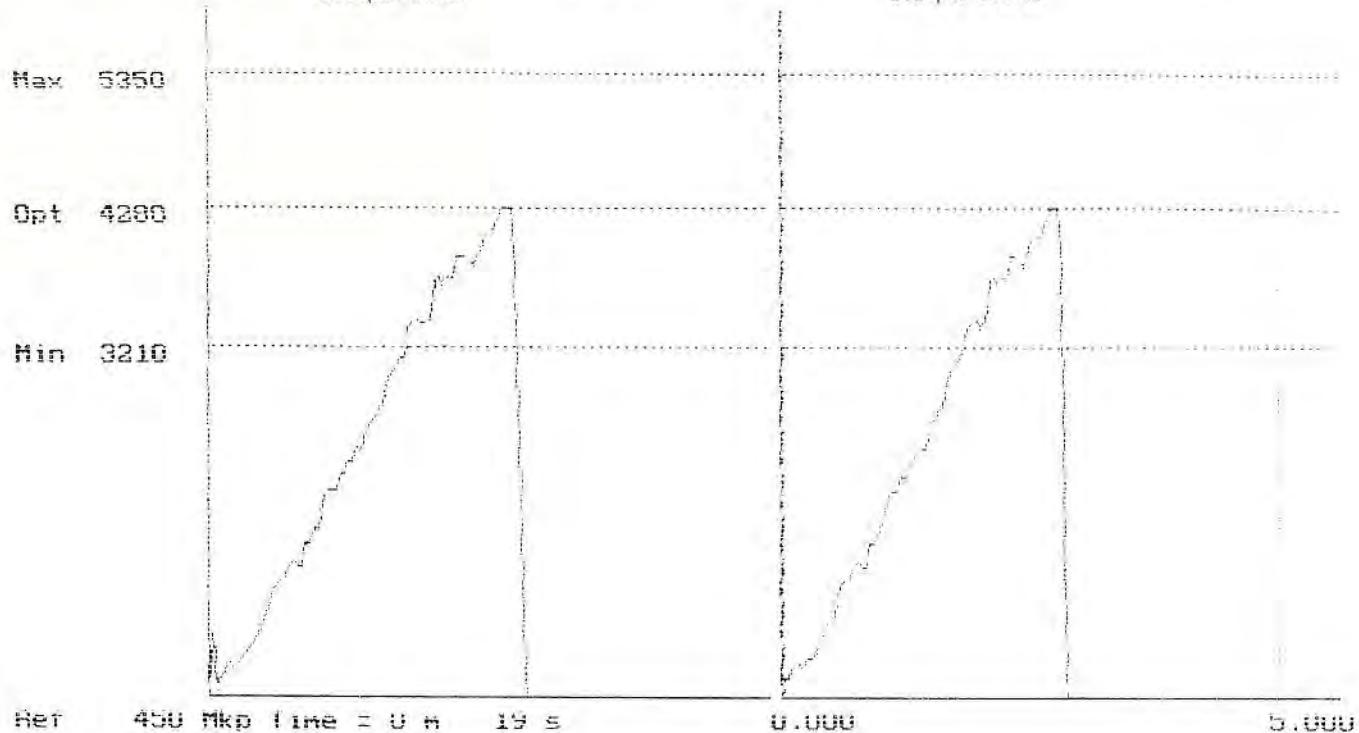


Applied Torque = 4285 Top Turns = 3.496

Comments:OK TU

WEATHERFORD JAM SERVICES

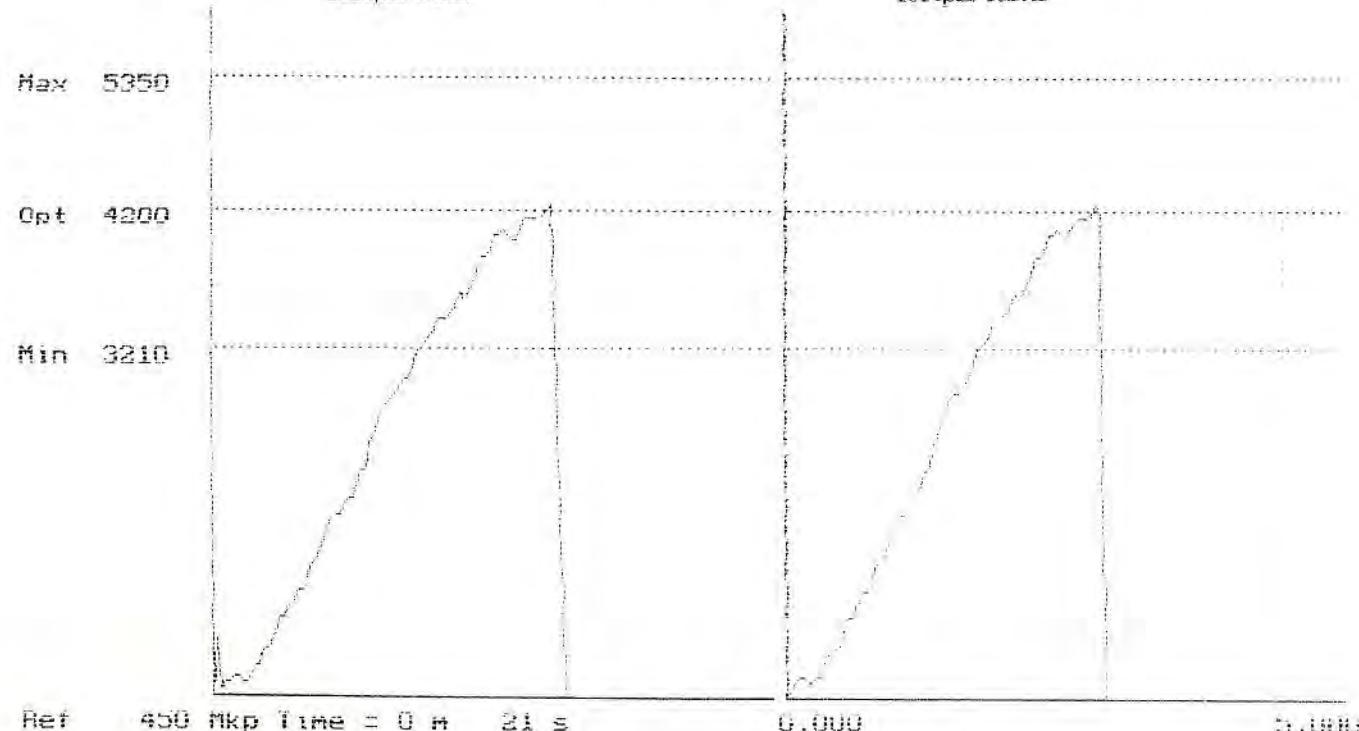
16:39 03/07/94 ACCEPT Joint # = 29 Log # = 29 Red String LHC 5 1/2 20# N=80
 Torque/Time Torque/Turns



Applied Torque = 4292 Top Turns = 2.803

Comments:OK TU

16:42 03/07/94 ACCEPT Joint # = 30 Log # = 30 Red String LHC 5 1/2 20# N=80
 Torque/Time Torque/Turns

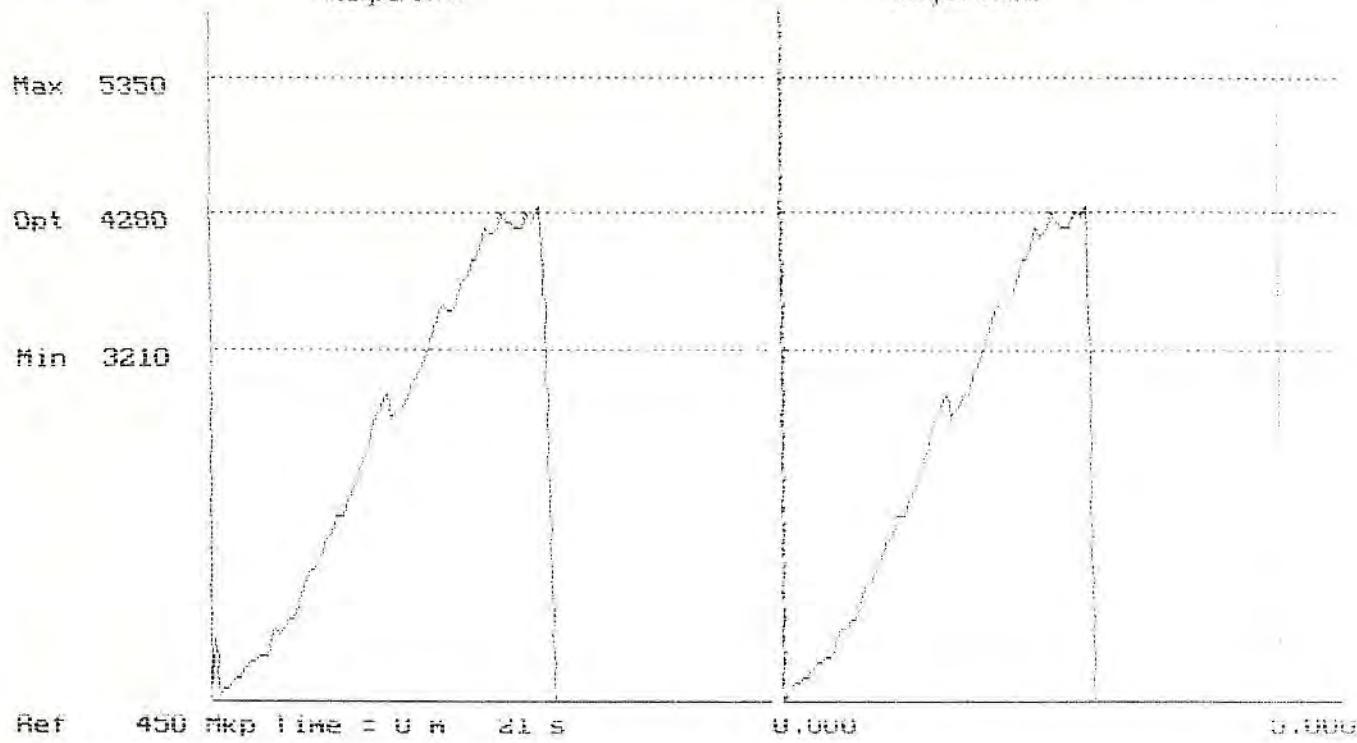


Applied Torque = 4318 Top Turns = 3.156

Comments:OK TU

WEATHERFORD JAM SERVICES

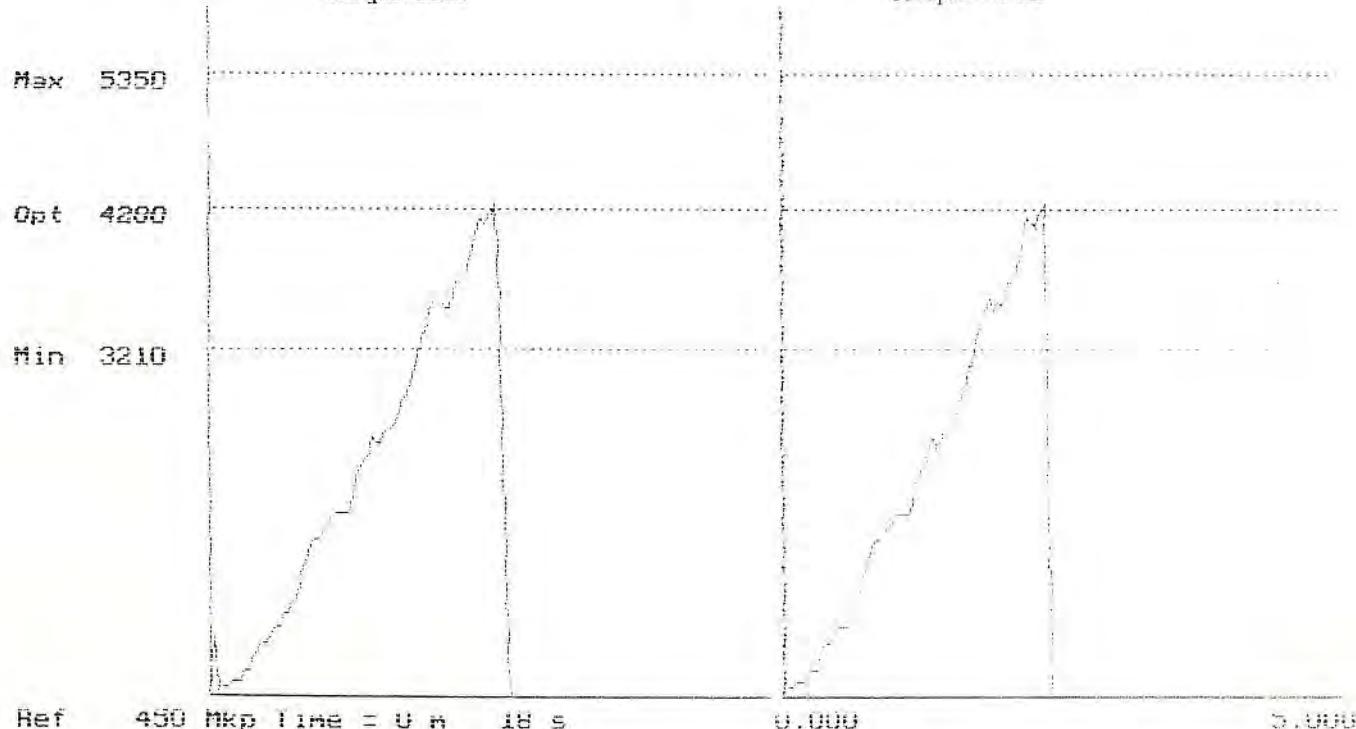
16:46 03/07/94 ACCEPT Joint # = 31 Log # = 31 Red String L1C 5 1/2 20# N=80
Torque/Time Torque/Turns



Applied Torque = 4332 Top Turns = 3.093

Comments:OK TU

16:49 03/07/94 ACCEPT Joint # = 32 Log # = 32 Red String L1C 5 1/2 20# N=80
Torque/Time Torque/Turns



Applied Torque = 4305 Top Turns = 2.659

Comments:OK TU

WEATHERFORD JAM SERVICES

16:52 03/07/94 ACCEPT Joint # = 33 Log # = 33 Red String LHC 5 1/2 20# N=80
Torque/Time Torque/Turns

Max 5350

Opt 4200

Min 3210

Ref 450 Mkp Time = 0 h 22 s

0.000

5.000

Applied Torque = 4332 Top Turns = 3.205

Comments:OK TU

16:55 03/07/94 ACCEPT Joint # = 34 Log # = 34 Red String LHC 5 1/2 20# N=80
Torque/Time Torque/Turns

Max 5350

Opt 4200

Min 3210

Ref 450 Mkp Time = 0 h 21 s

0.000

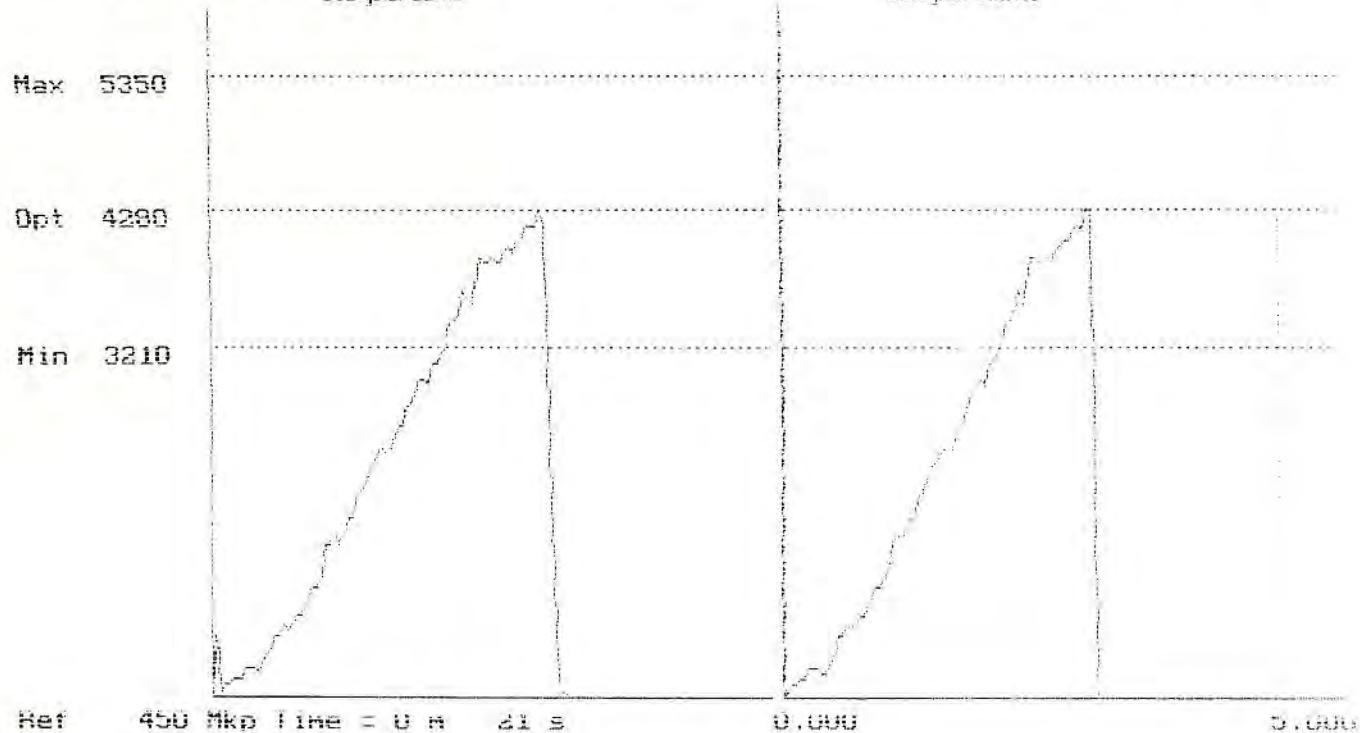
5.000

Applied Torque = 4285 Top Turns = 3.237

Comments:OK TU

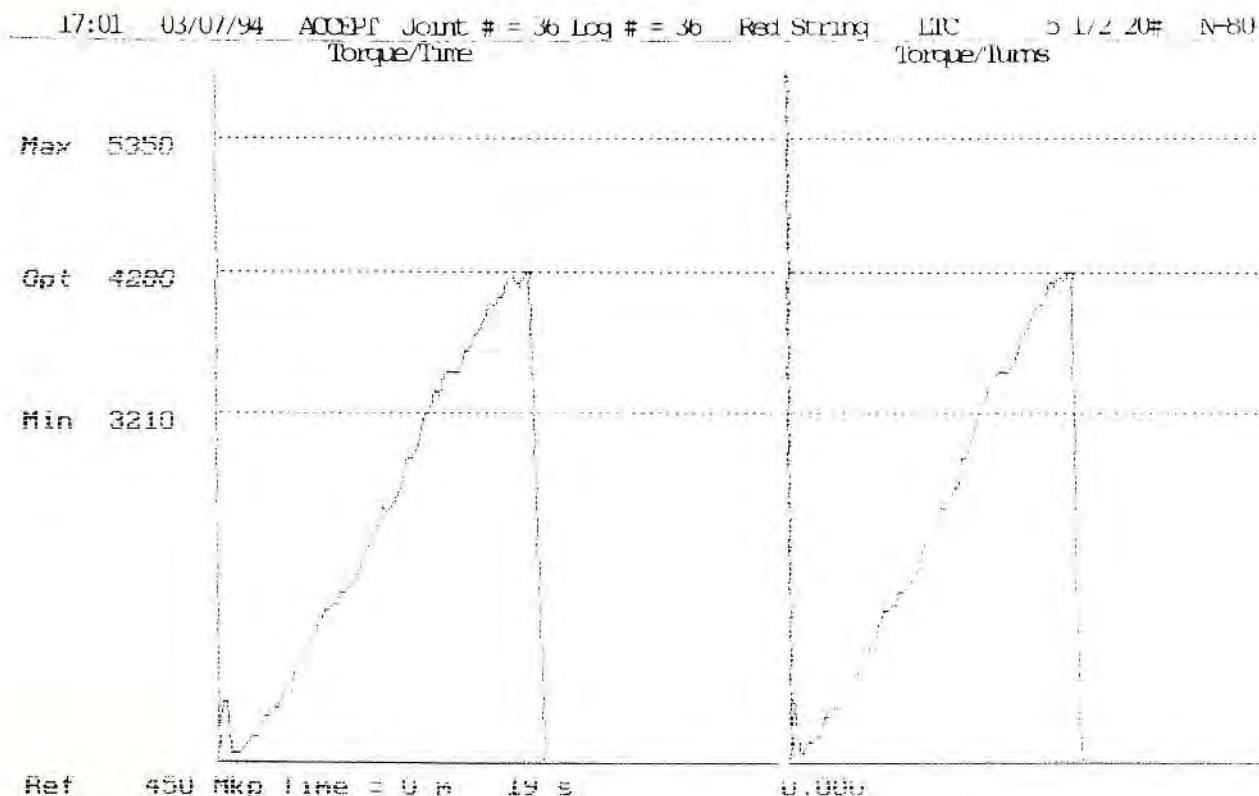
WEATHERFORD JAM SERVICES

16:58 03/07/94 ACCEPT Joint # = 35 Log # = 35 Red String L1C 5 1/2 20# N=80
 Torque/Time Torque/Turns



Applied Torque = 4292 Top Turns = 3.117

Comments:OK TU

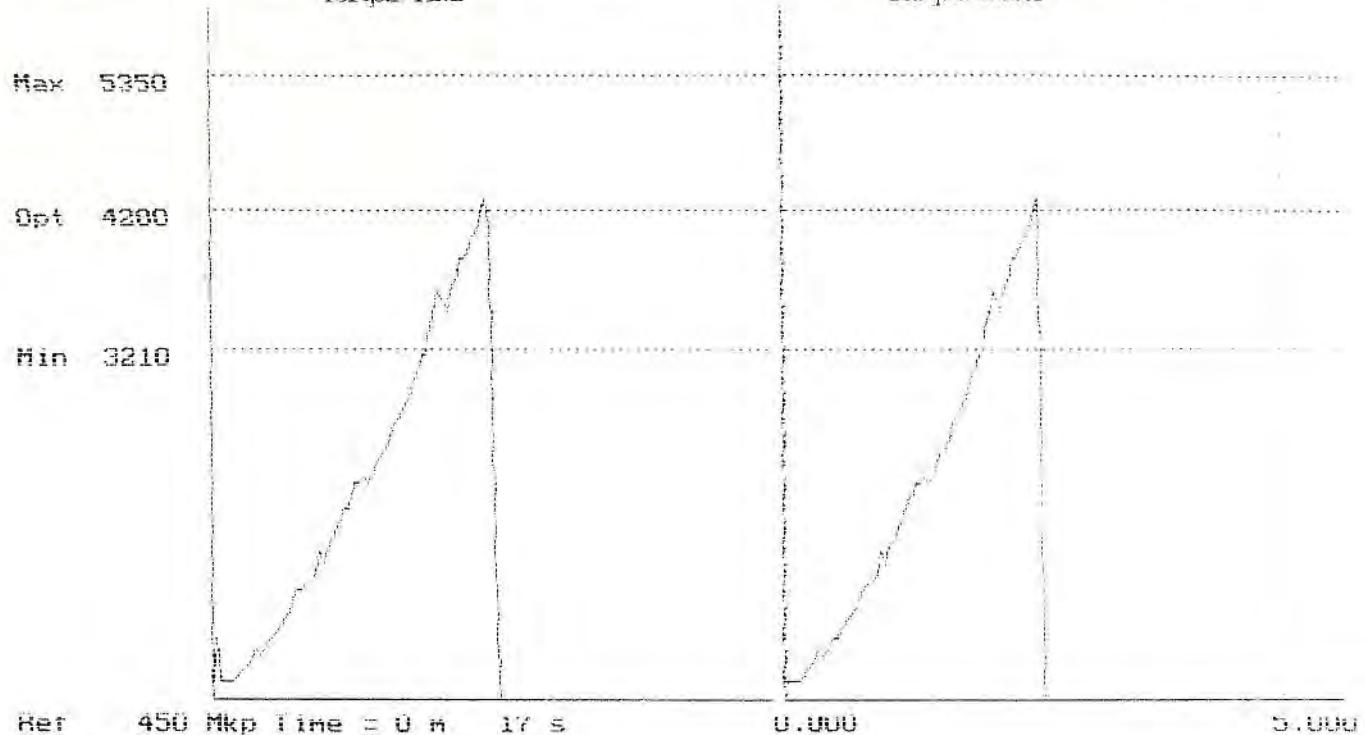


Applied Torque = 4292 Top Turns = 2.881

Comments:OK TU

WEATHERFORD JAM SERVICES

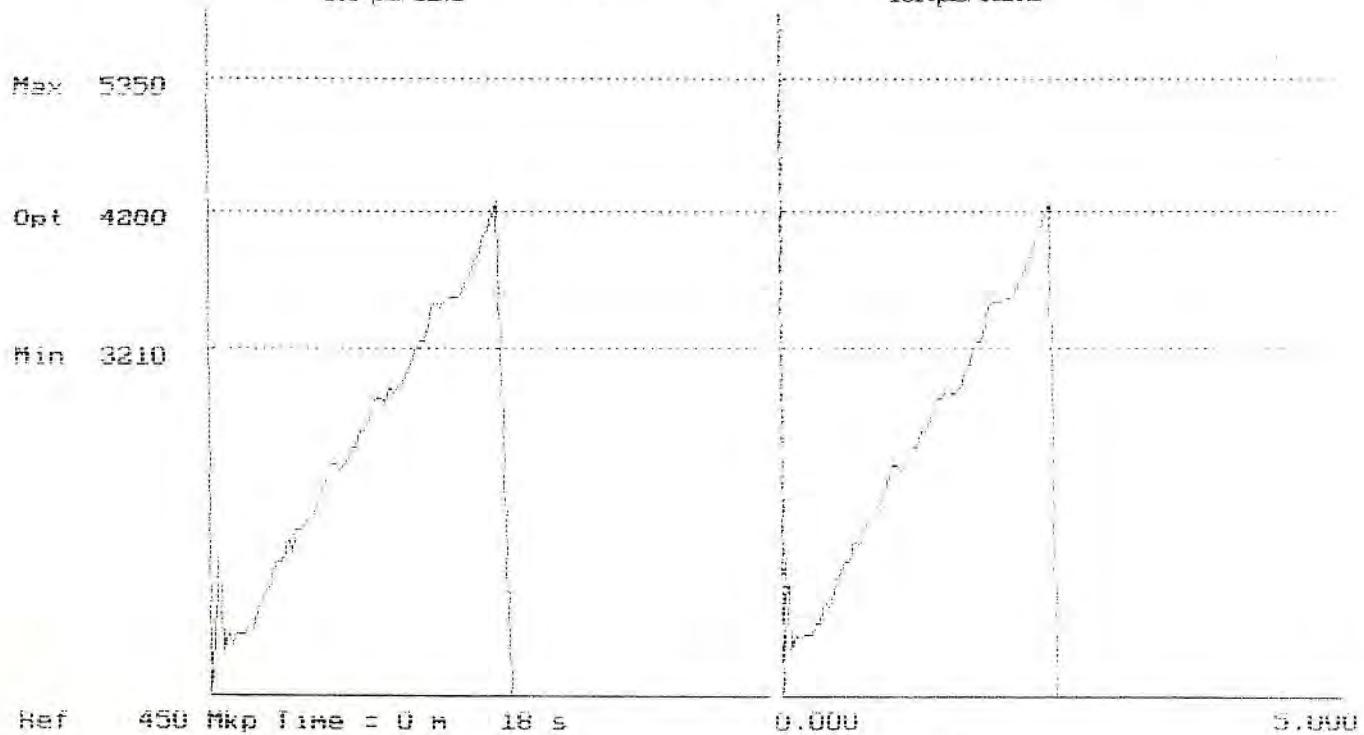
17:04 03/07/94 ACCEPT Joint # = 37 Log # = 37 Red String LFC 5 1/2 20# N=80
 Torque/Time Torque/Turns



Applied Torque = 4358 Top Turns = 2.578

Comments:OK TU

17:06 03/07/94 ACCEPT Joint # = 38 Log # = 38 Red String LFC 5 1/2 20# N=80
 Torque/Time Torque/Turns



Applied Torque = 4338 Top Turns = 2.691

Comments:OK TU

WEATHERFORD JAM SERVICES

17:09 03/07/94 ACCEPT Joint # = 39 Log # = 39 Red String L1C 5 1/2 20# N=80
 Torque/Time Torque/Turns

Max 5350

Opt 4298

Min 3210

Ref 450 mfp Time = 0 h 19 s

0.000

0.000

Applied Torque = 4298 Top Turns = 2.905

Comments:OK TU

17:12 03/07/94 ACCEPT Joint # = 40 Log # = 40 Red String L1C 5 1/2 20# N=80
 Torque/Time Torque/Turns

Max 5350

Opt 4298

Min 3210

Ref 450 mfp Time = 0 h 18 s

0.000

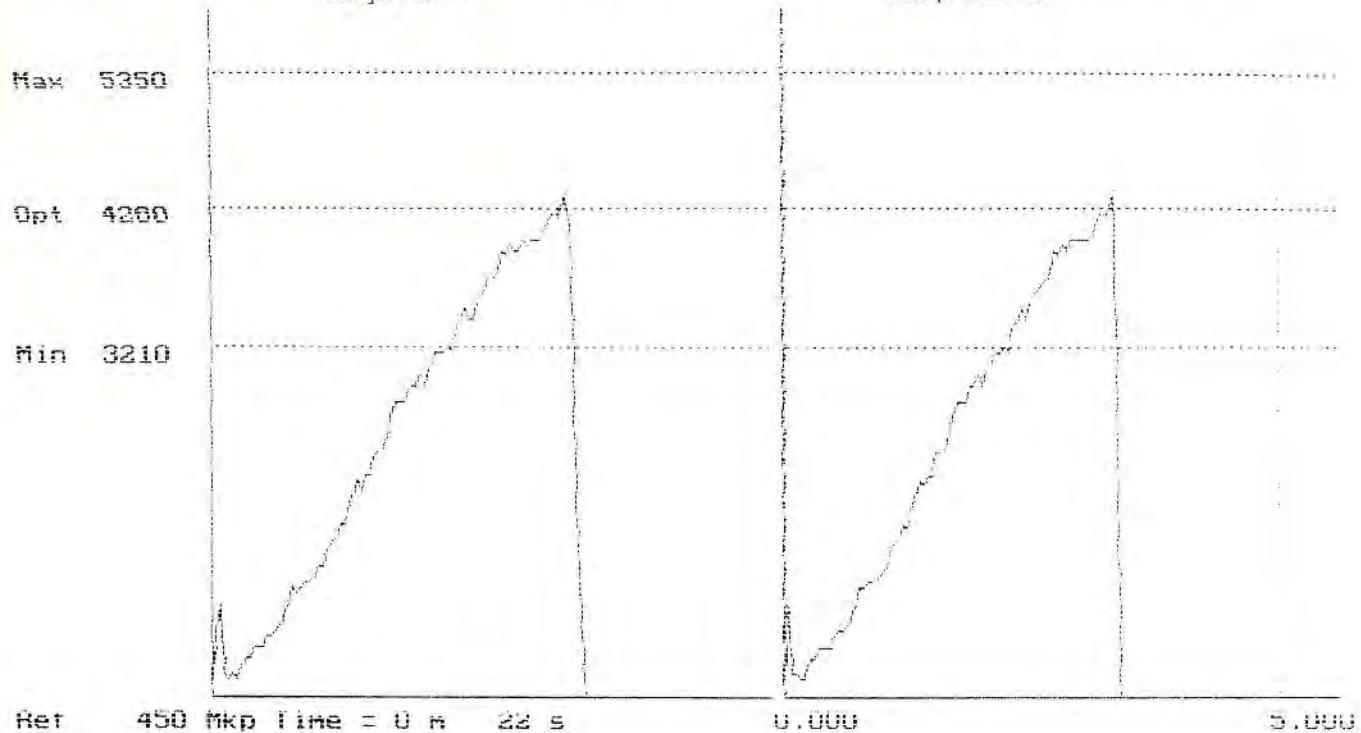
0.000

Applied Torque = 4292 Top Turns = 2.785

Comments:OK TU

WEATHERFORD JAM SERVICES

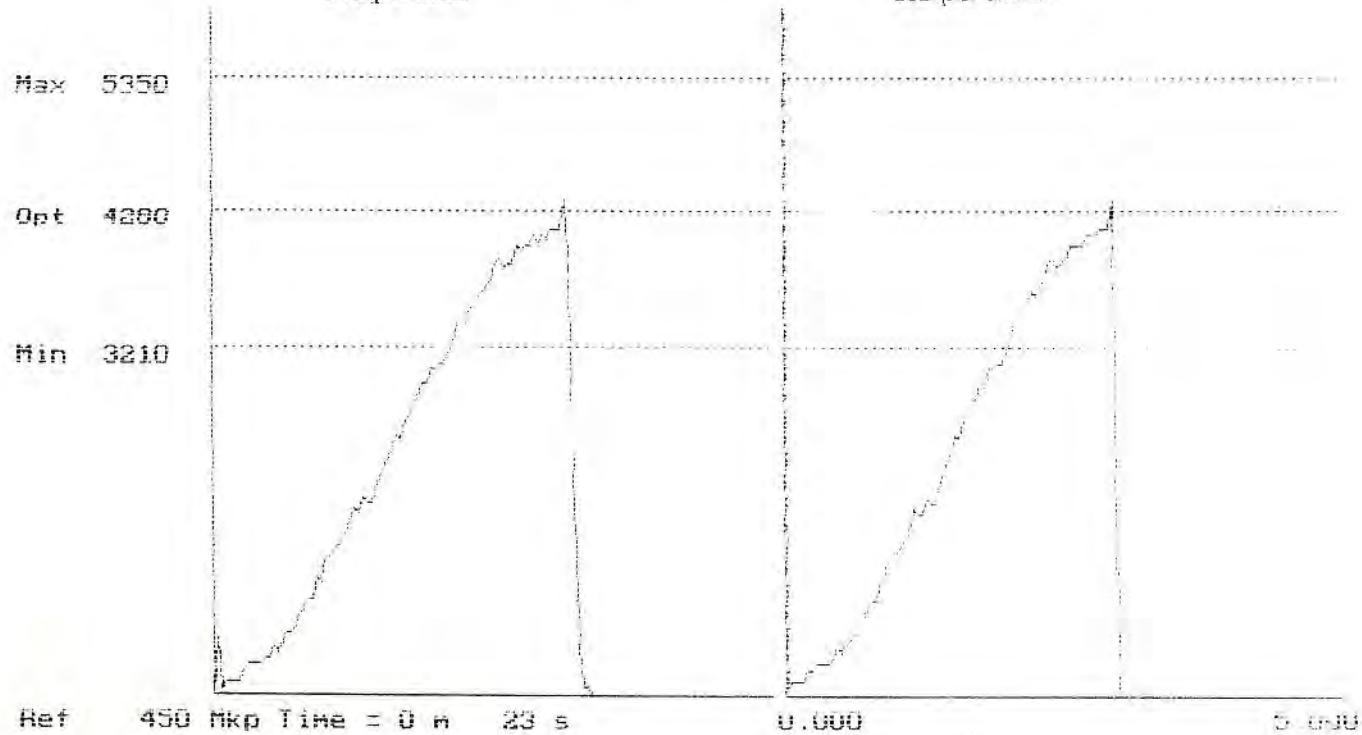
17:17 03/07/94 ACCEPT Joint # = 41 Log # = 41 Red String ETC 5 1/2 20# N=80
 Torque/Time Torque/Turns



Applied Torque = 4385 Top Turns = 3.345

Comments:OK TU

17:20 03/07/94 ACCEPT Joint # = 42 Log # = 42 Red String ETC 5 1/2 20# N=80
 Torque/Time Torque/Turns



Applied Torque = 4345 Top Turns = 3.298

Comments:OK TU

WEATHERFORD JAM SERVICES

17:24 03/07/94 ACCEPT Joint # = 43 Log # = 43 Red String EUC 5 1/2 20# N-80
 Torque/Time Torque/Turns

Max 5350

Opt 4285

Min 3210

Ref 450 Mkp Time = 0 hr 26 s

0.000

5.000

Applied Torque = 4285 Top Turns = 3.898

Comments:OK TU

17:27 03/07/94 ACCEPT Joint # = 44 Log # = 44 Red String EUC 5 1/2 20# N-80
 Torque/Time Torque/Turns

Max 5350

Opt 4285

Min 3210

Ref 450 Mkp Time = 0 hr 26 s

0.000

5.000

Applied Torque = 4318 Top Turns = 2.995

Comments:OK TU

WEATHERFORD JAM SERVICES

17:30 03/07/94 ACCEPT Joint # = 45 Log # = 45 Red String LTC 5 1/2 20# N=80
 Torque/Time Torque/Turns

Max 5350

Opt 4280

Min 3210

Ref 450 Mkp Time = 0 hr 30 s

0.000

3.000

Applied Torque = 4325 Top Turns = 5.141

Comments:OK TU

17:33 03/07/94 ACCEPT Joint # = 46 Log # = 46 Red String LTC 5 1/2 20# N=80
 Torque/Time Torque/Turns

Max 5350

Opt 4280

Min 3210

Ref 450 Mkp Time = 0 hr 30 s

0.000

3.000

Applied Torque = 4292 Top Turns = 4.562

Comments:OK TU

WEATHERFORD JAM SERVICES

17:37 03/07/94 ACCEPT Joint # = 47 Log # = 47 Red String LFC 5 1/2 20# N=80
 Torque/Time Torque/Turns

Max 5350

Opt 4280

Min 3210

Ref 450 Mkp Time = 0 s 27 s

0.000

5.000

Applied Torque = 4292 Top Turns = 4.040

Comments:OK TU

17:40 03/07/94 ACCEPT Joint # = 48 Log # = 48 Red String LFC 5 1/2 20# N=80
 Torque/Time Torque/Turns

Max 5350

Opt 4280

Min 3210

Ref 450 Mkp Time = 0 s 22 s

0.000

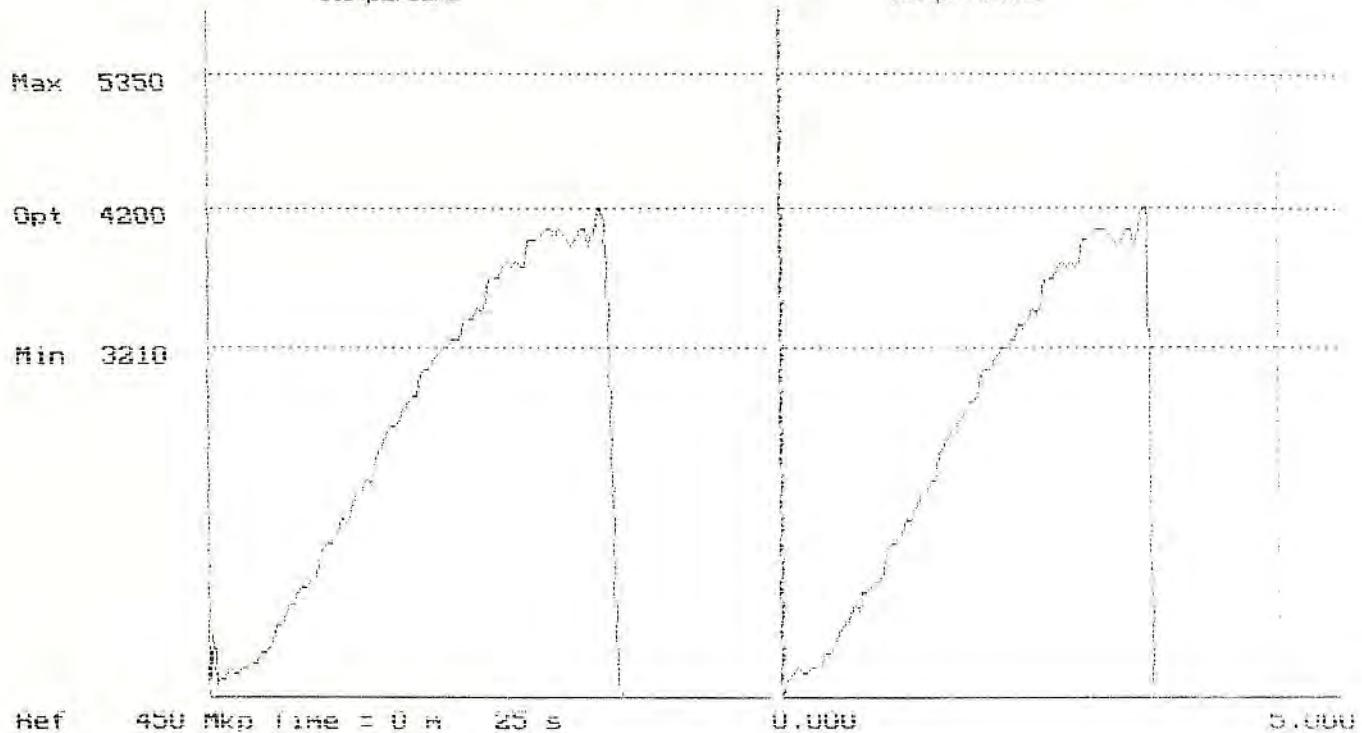
5.000

Applied Torque = 4285 Top Turns = 3.380

Comments:OK TU

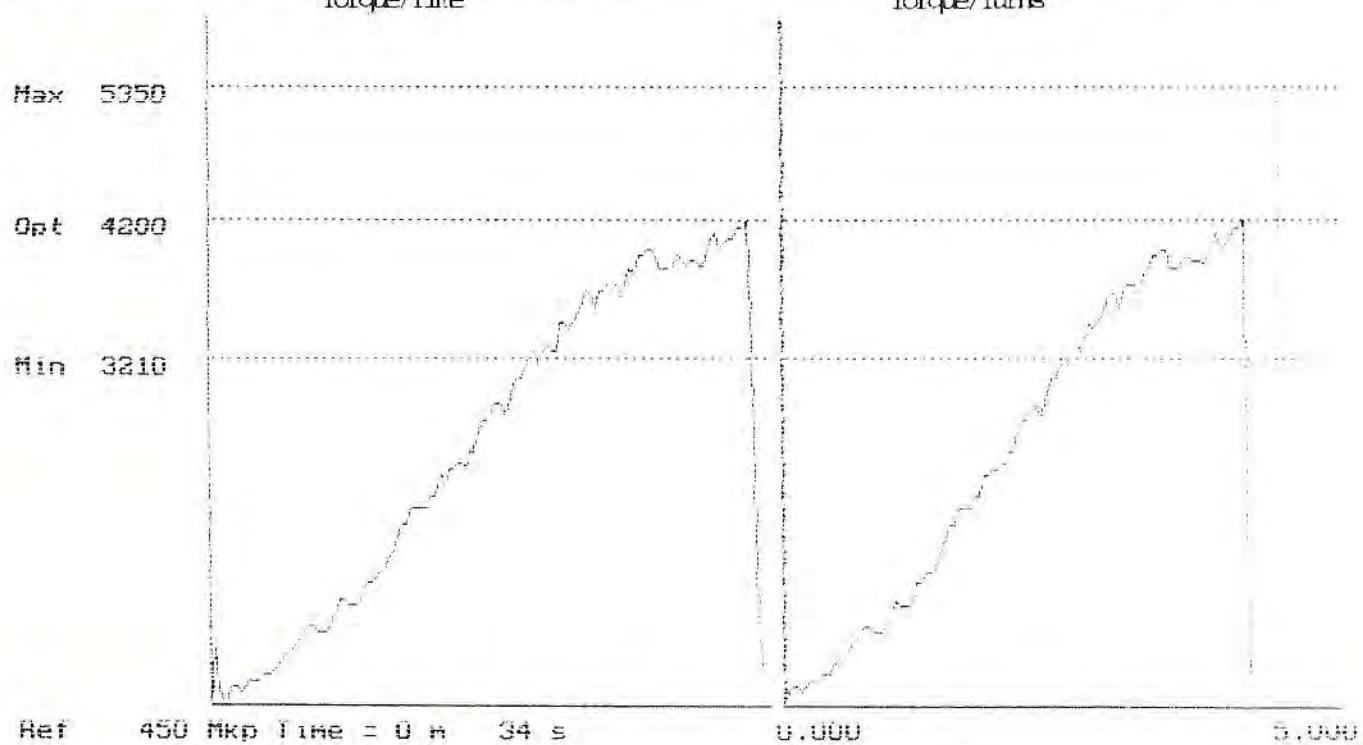
WEATHERFORD JAM SERVICES

17:43 03/07/94 ACCEPT Joint # = 49 Log # = 49 Red String L1C 5 1/2 20# N=80
Torque/Time Torque/Turns



Comments:OK TU

07:09 03/08/94 ACCEPT Joint # = 50 Log # = 50 Red String L1C 5 1/2 20# N=80
Torque/Time Torque/Turns



Applied Torque = 4285 Top Turns = 4.632

Comments:OK TU

WEATHERFORD JAM SERVICES

07:13 03/08/94 ACCEPT Joint # = 51 Log # = 51 Red String LTC 5 1/2 20# N-80
 Torque/Time Torque/Tums

Max 5350

Opt 4200

Min 3210

Ref 450 Mkp Time = 0 h 30 s

0.000 5.000

Applied Torque = 4314 Top Turns = 4.293

Comments:OK TU

07:17 03/08/94 ACCEPT Joint # = 52 Log # = 52 Red String LTC 5 1/2 20# N-80
 Torque/Time Torque/Tums

Max 5350

Opt 4200

Min 3210

Ref 450 Mkp Time = 0 h 33 s

0.000 5.000

Applied Torque = 4285 Top Turns = 4.826

Comments:OK TU

WEATHERFORD JAM SERVICES

07:22 03/08/94 ACCEPT Joint # = 53 Log # = 53 Red String L1C 5 1/2 20# N=80
Torque/Time Torque/Turns

Max 5350

Opt 4285

Min 3210

Ref 450 MRP Time = 0 hr 29 s

0.000

5.000

Applied Torque = 4285 Top Turns = 4.199

Comments:OK TU

07:25 03/08/94 ACCEPT Joint # = 54 Log # = 54 Red String L1C 5 1/2 20# N=80
Torque/Time Torque/Turns

Max 5350

Opt 4285

Min 3210

Ref 450 MRP Time = 0 hr 33 s

0.000

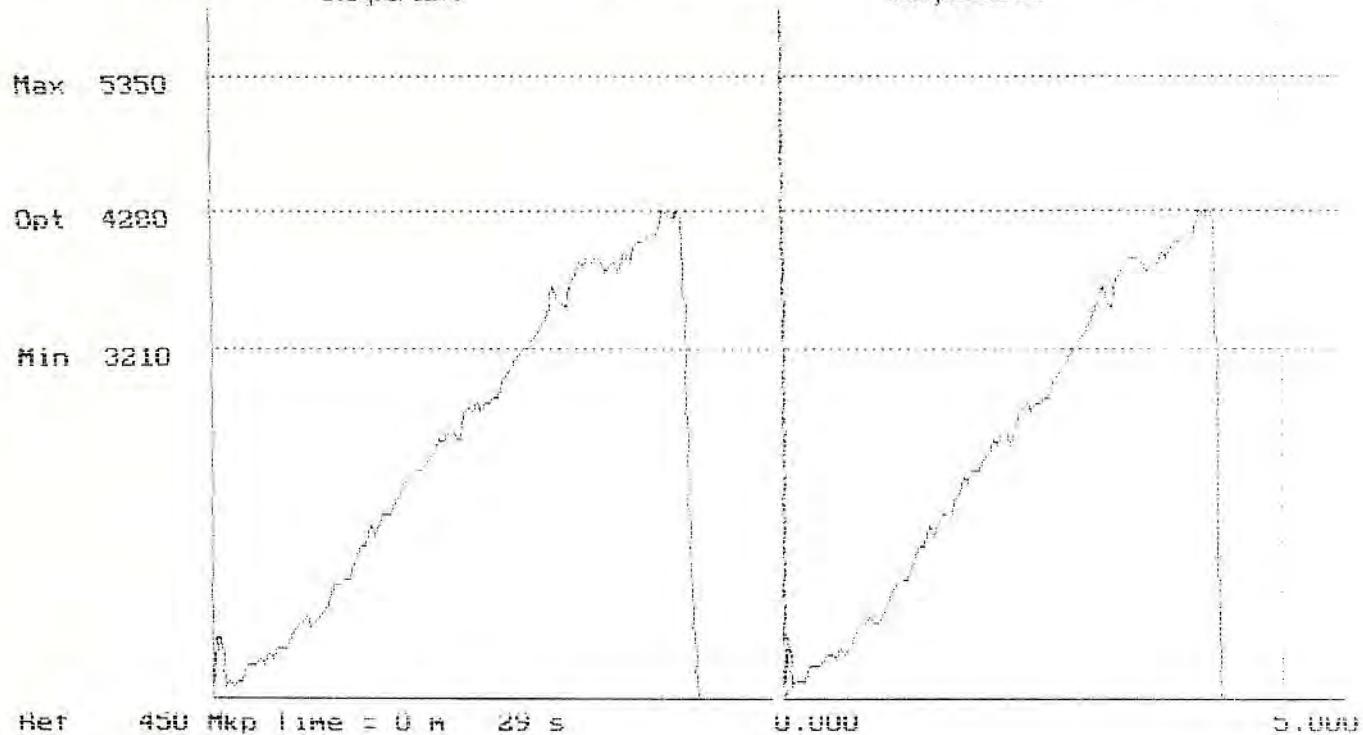
5.000

Applied Torque = 4345 Top Turns = 4.772

Comments:OK TU

WEATHERFORD JAM SERVICES

07:29 03/08/94 ACCEPT Joint # = 55 Log # = 55 Red String LTC 5 1/2 20# N-80
 Torque/Time Torque/Turns



Ref 450 Mkp Time = 0 hr 29 s

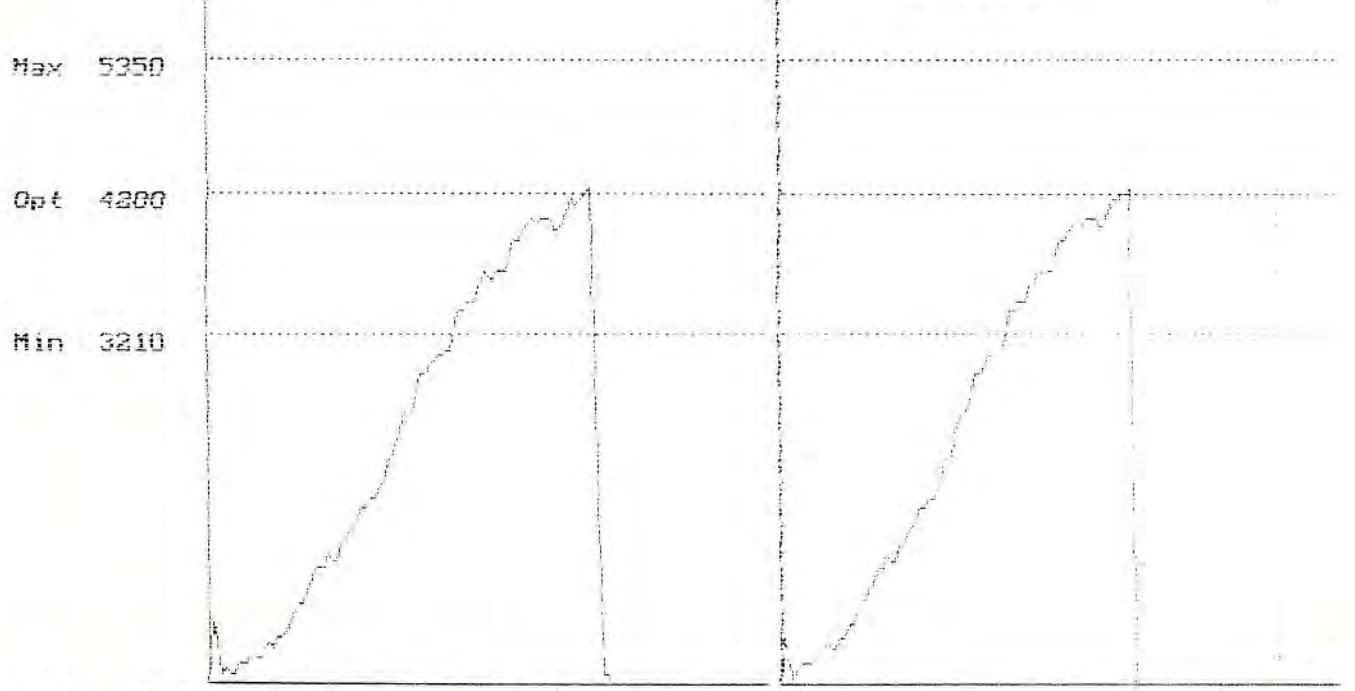
0.000

5.000

Applied Torque = 4285 Top Turns = 4.319

Comments:OK TU

07:32 03/08/94 ACCEPT Joint # = 56 Log # = 56 Red String LTC 5 1/2 20# N-80
 Torque/Time Torque/Turns



Ref 450 Mkp Time = 0 hr 24 s

0.000

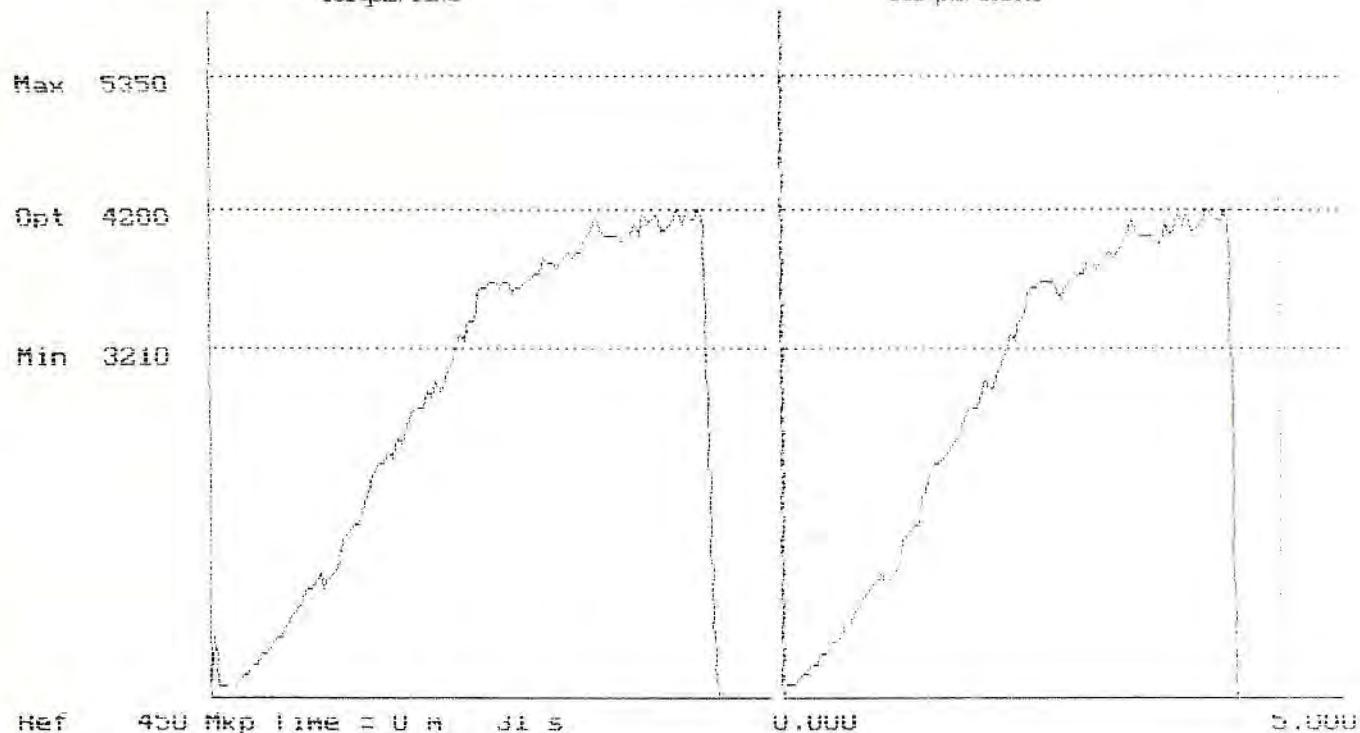
5.000

Applied Torque = 4305 Top Turns = 3.512

Comments:OK TU

WEATHERFORD JAM SERVICES

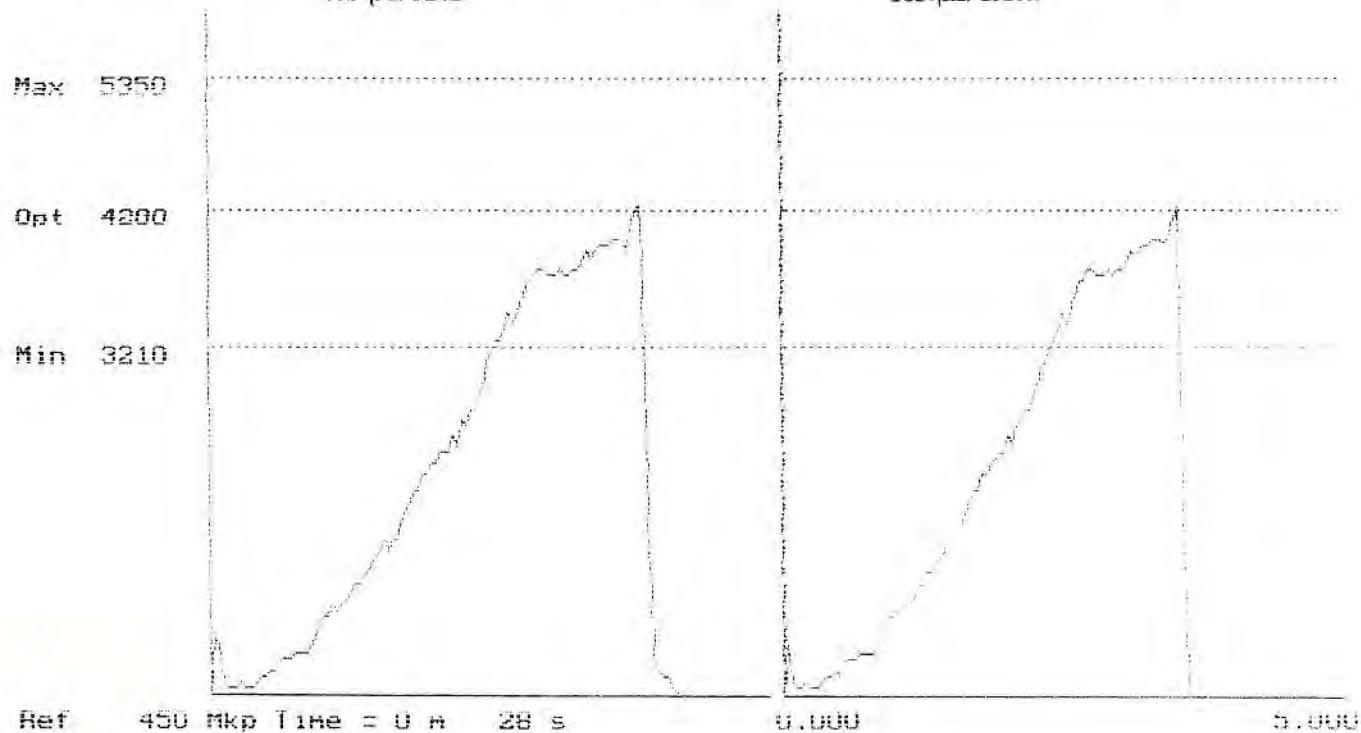
07:35 03/08/94 ACCEPT Joint # = 57 Log # = 57 Red String LIC 5 1/2 20# N=80
 Torque/Time Torque/Turns



Applied Torque = 4292 Top Turns = 4.484

Comments:OK TU

07:38 03/08/94 ACCEPT Joint # = 58 Log # = 58 Red String LIC 5 1/2 20# N=80
 Torque/Time Torque/Turns

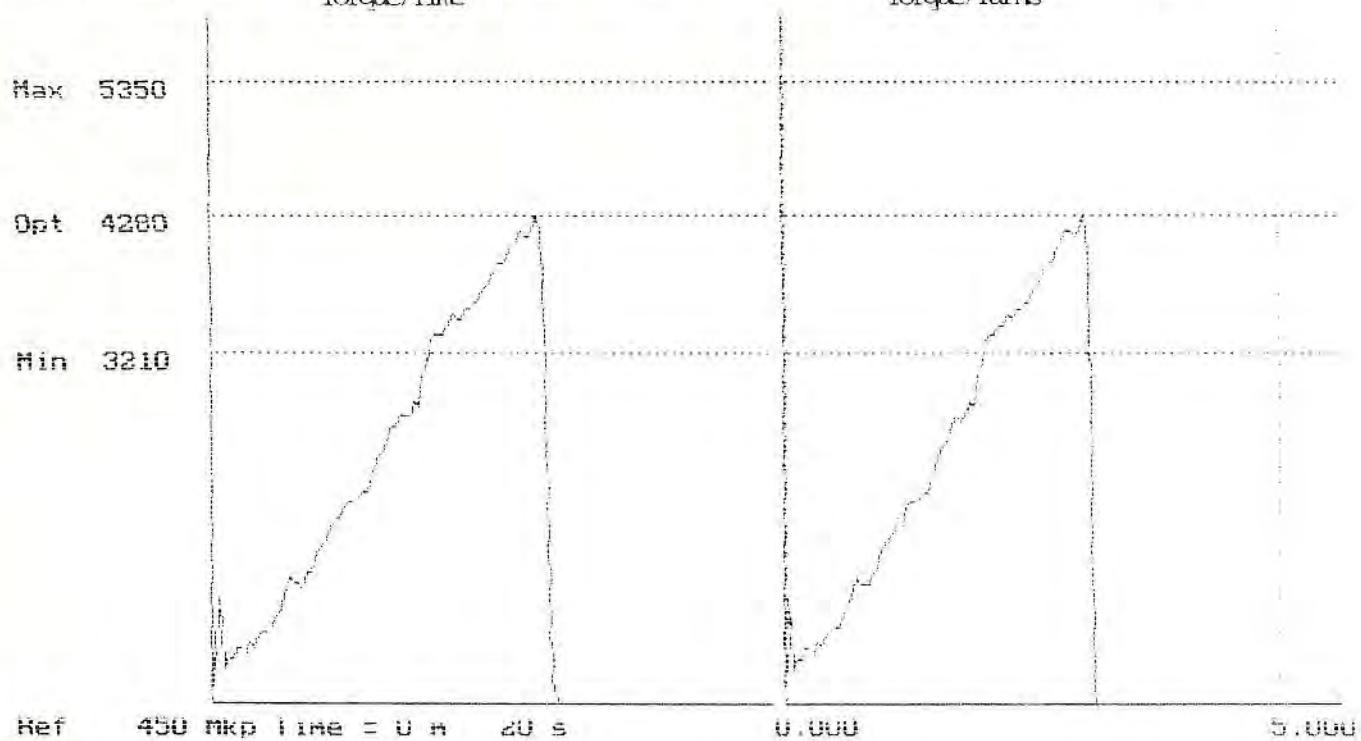


Applied Torque = 4325 Top Turns = 4.006

Comments:OK TU

WEATHERFORD JAM SERVICES

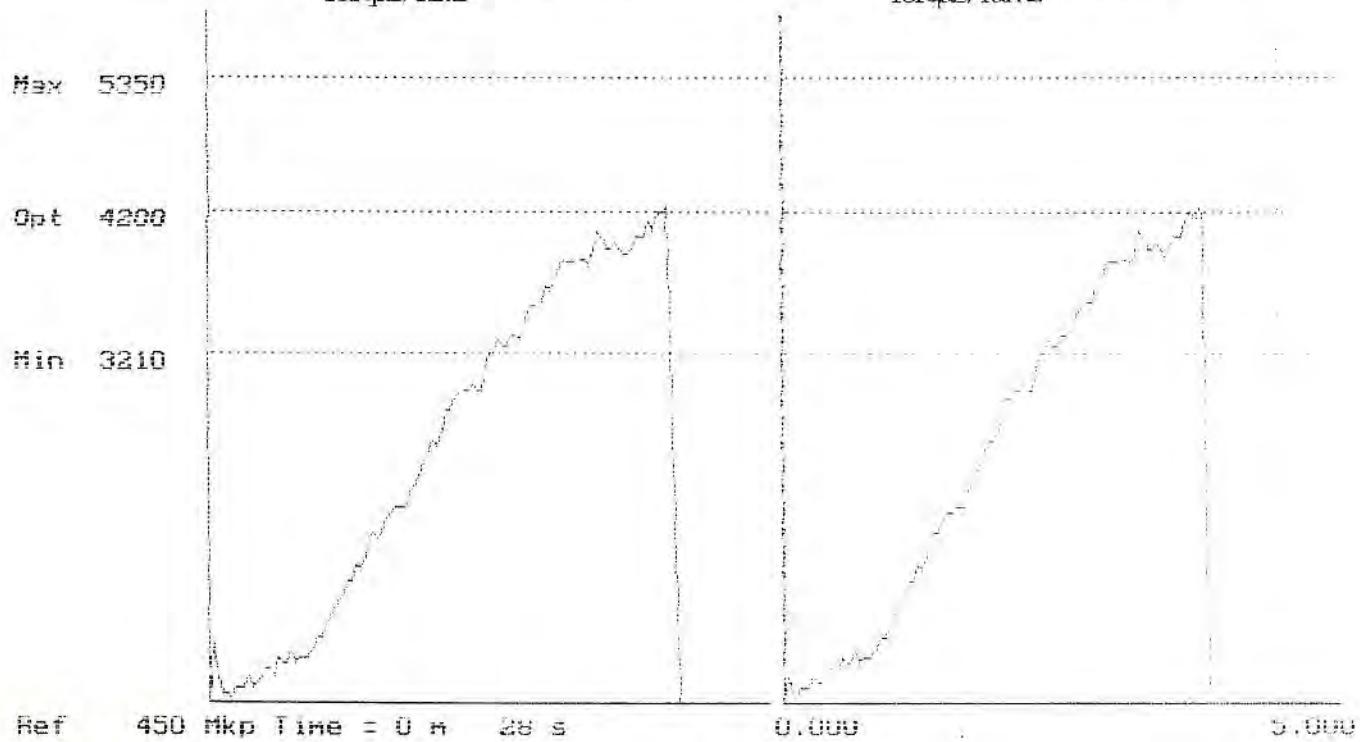
07:41 03/08/94 ACCEPT Joint # = 59 Log # = 59 Red String LHC 5 1/2 20# N-80
 Torque/Time Torque/Turns



Applied Torque = 4285 Top Turns = 3.061

Comments:OK TU

07:44 03/08/94 ACCEPT Joint # = 60 Log # = 60 Red String LHC 5 1/2 20# N-80
 Torque/Time Torque/Turns

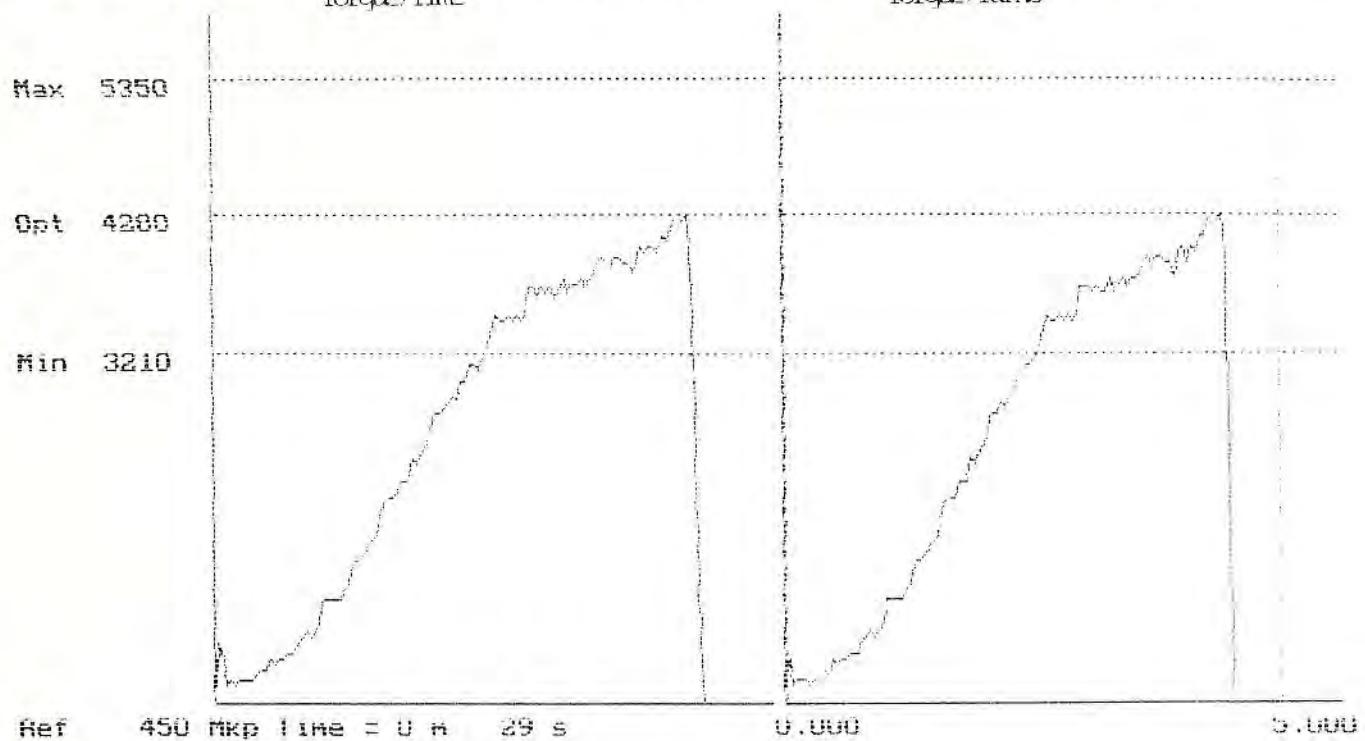


Applied Torque = 4332 Top Turns = 4.229

Comments:OK TU

WEATHERFORD JAM SERVICES

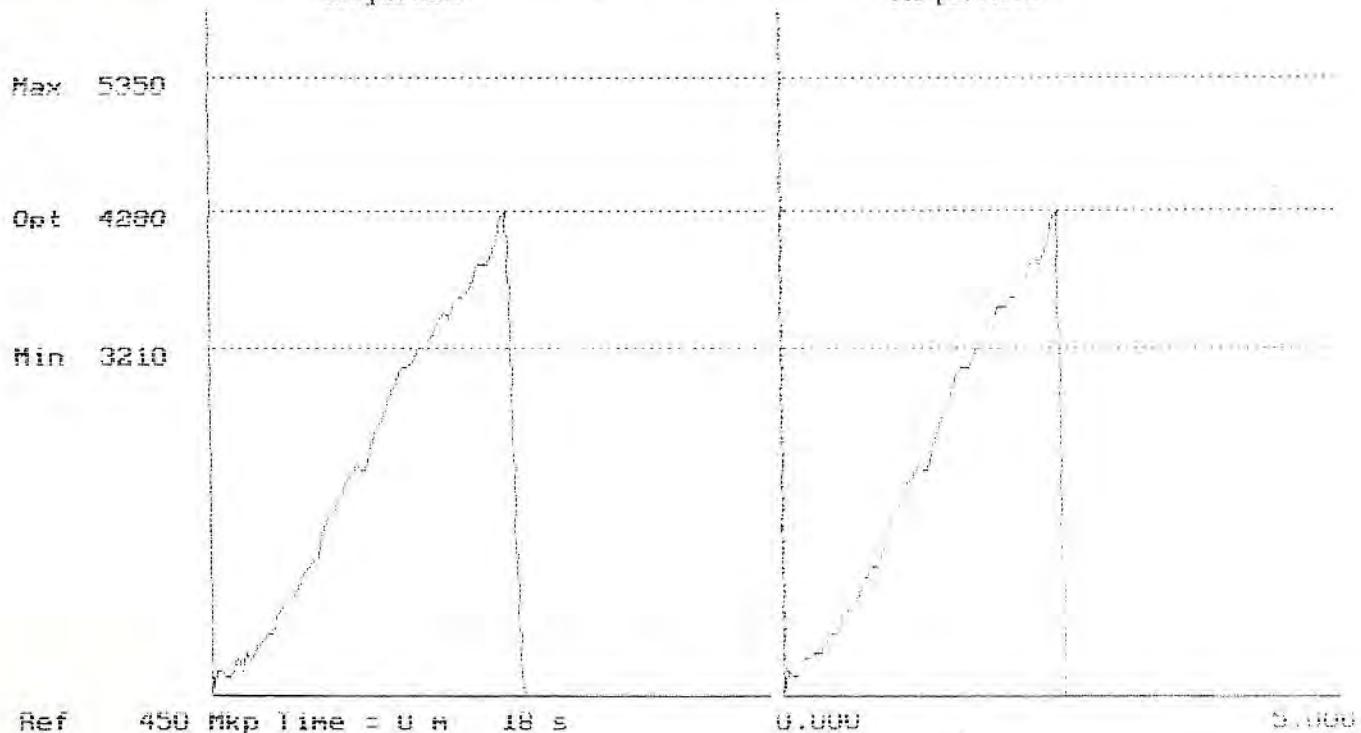
07:47 03/08/94 ACCEPT Joint # = 61 Log # = 61 Red String LTC \rightarrow 1/2 20# N=80
 Torque/Time Torque/Turns



Applied Torque = 4292 Top Turns = 4.431

Comments:OK TU

07:50 03/08/94 ACCEPT Joint # = 62 Log # = 62 Red String LTC \rightarrow 1/2 20# N=80
 Torque/Time Torque/Turns

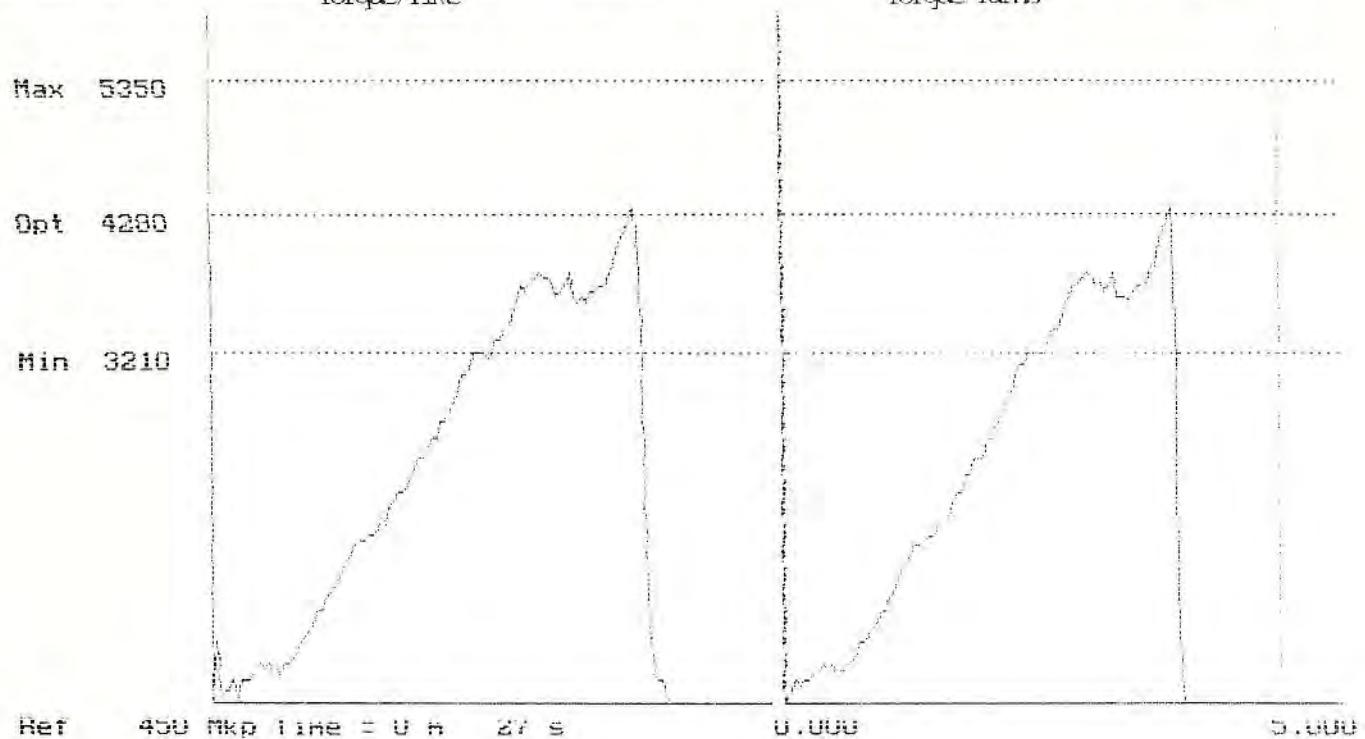


Applied Torque = 4272 Top Turns = 2.785

Comments:OK TU

WEATHERFORD JAM SERVICES

07:53 03/08/94 ACCEPT Joint # = 63 Log # = 63 Red String LLC 5 1/2 20# N=80
 Torque/Time Torque/Turns



Ref 450 Mkp Time = 0.8 27 s

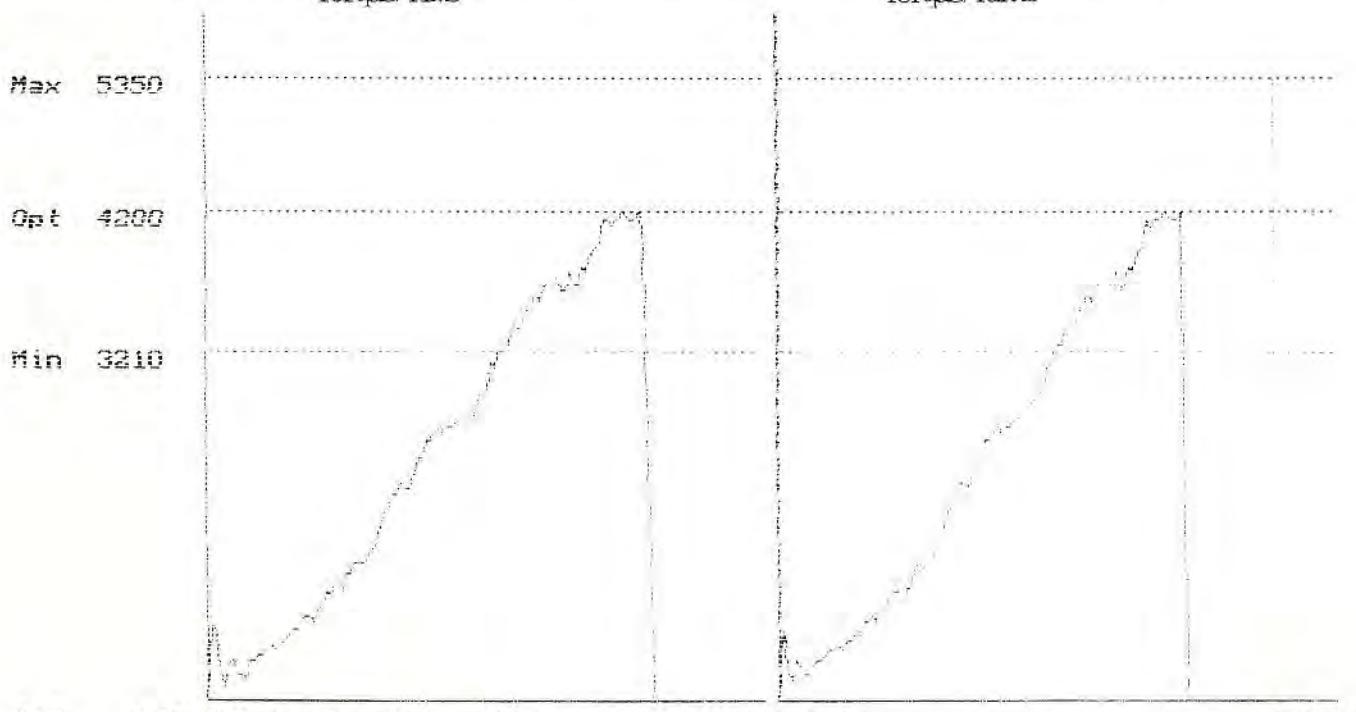
0.000

5.000

Applied Torque = 4318 Top Turns = 3.959

Comments:OK TU

07:56 03/08/94 ACCEPT Joint # = 64 Log # = 64 Red String LLC 5 1/2 20# N=80
 Torque/Time Torque/Turns



Ref 450 Mkp Time = 0.8 27 s

0.000

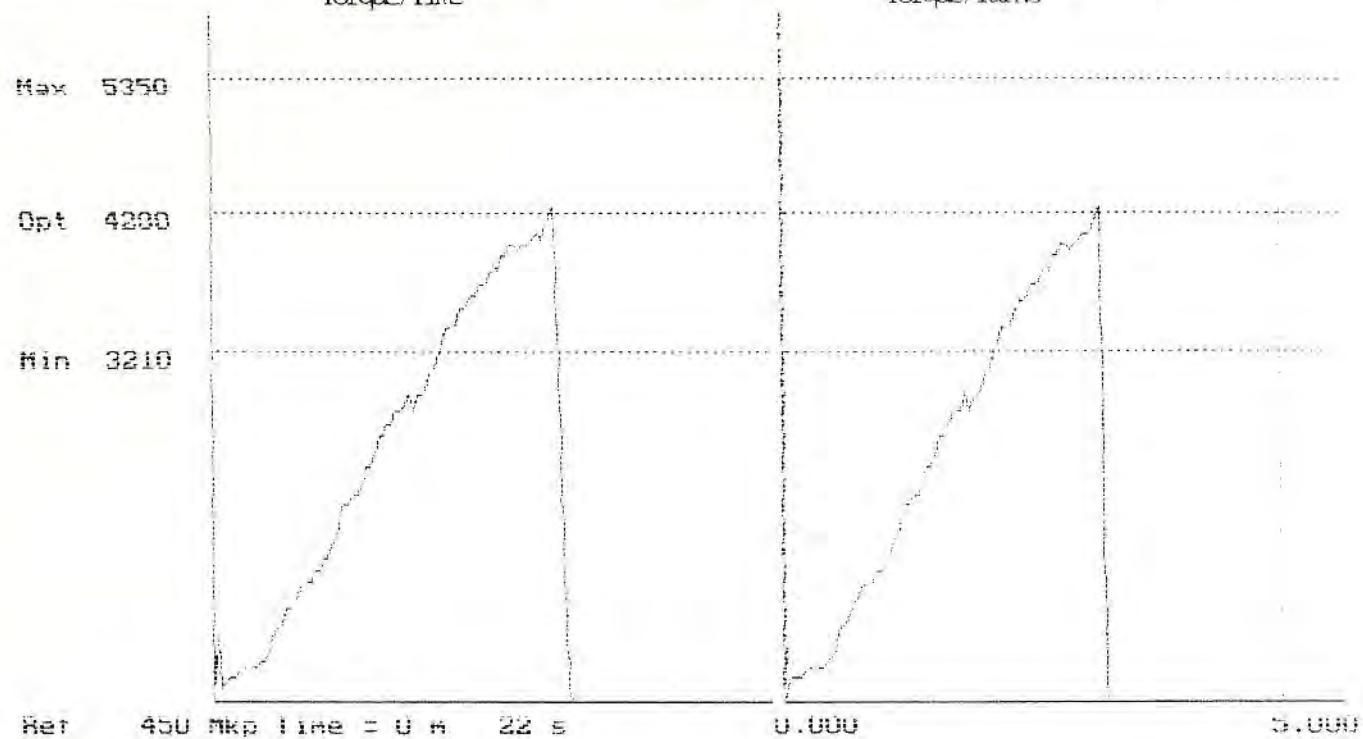
5.000

Applied Torque = 4285 Top Turns = 4.081

Comments:OK TU

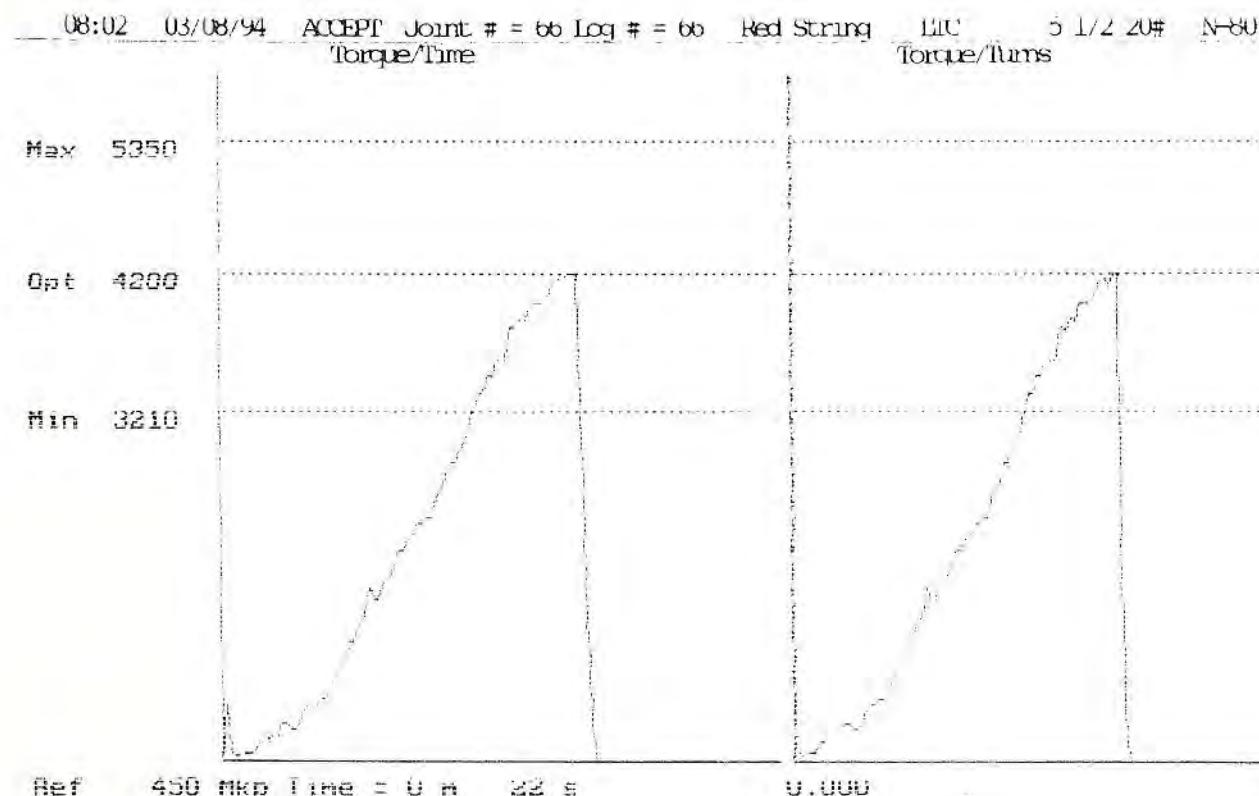
WEATHERFORD JAM SERVICES

07:59 03/08/94 ACCEPT Joint # = 65 Log # = 65 Red String LJC 5 1/2 20# N-80
 Torque/Time Torque/Turns



Applied Torque = 4328 Top Turns = 3.205

Comments:OK TU

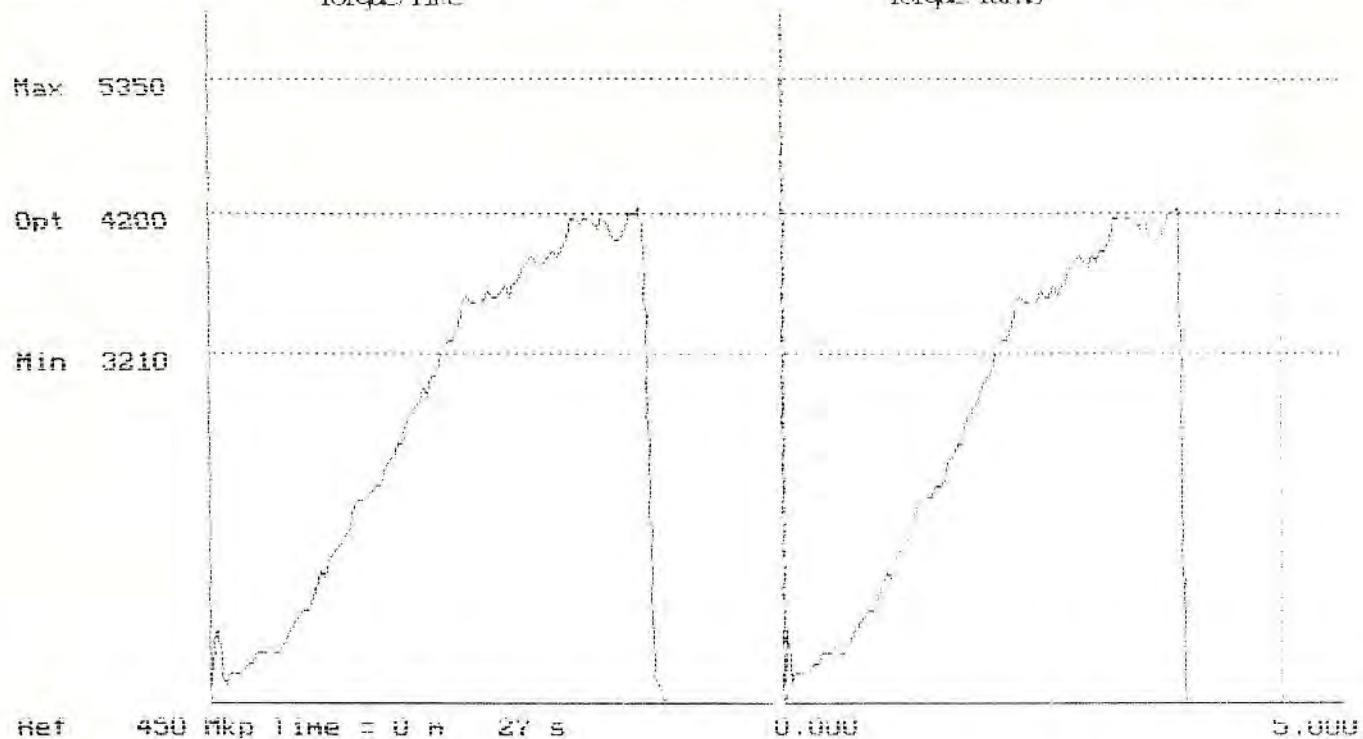


Applied Torque = 4292 Top Turns = 3.311

Comments:OK TU

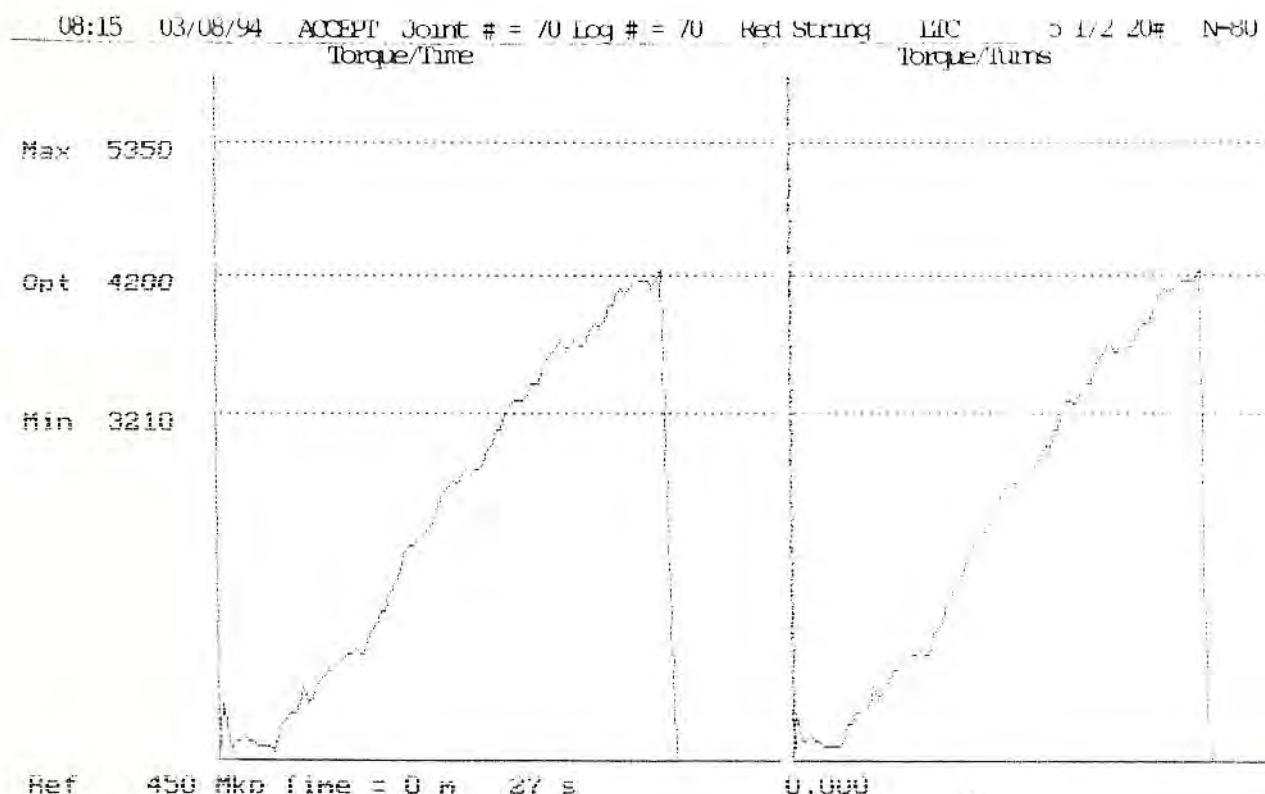
WEATHERFORD JAM SERVICES

08:12 03/08/94 ACCEPT Joint # = 69 Log # = 69 Red String LHC 5 1/2 20# N=80
 Torque/Time Torque/Turns



Applied Torque = 4298 Top Turns = 3.985

Comments:OK TU

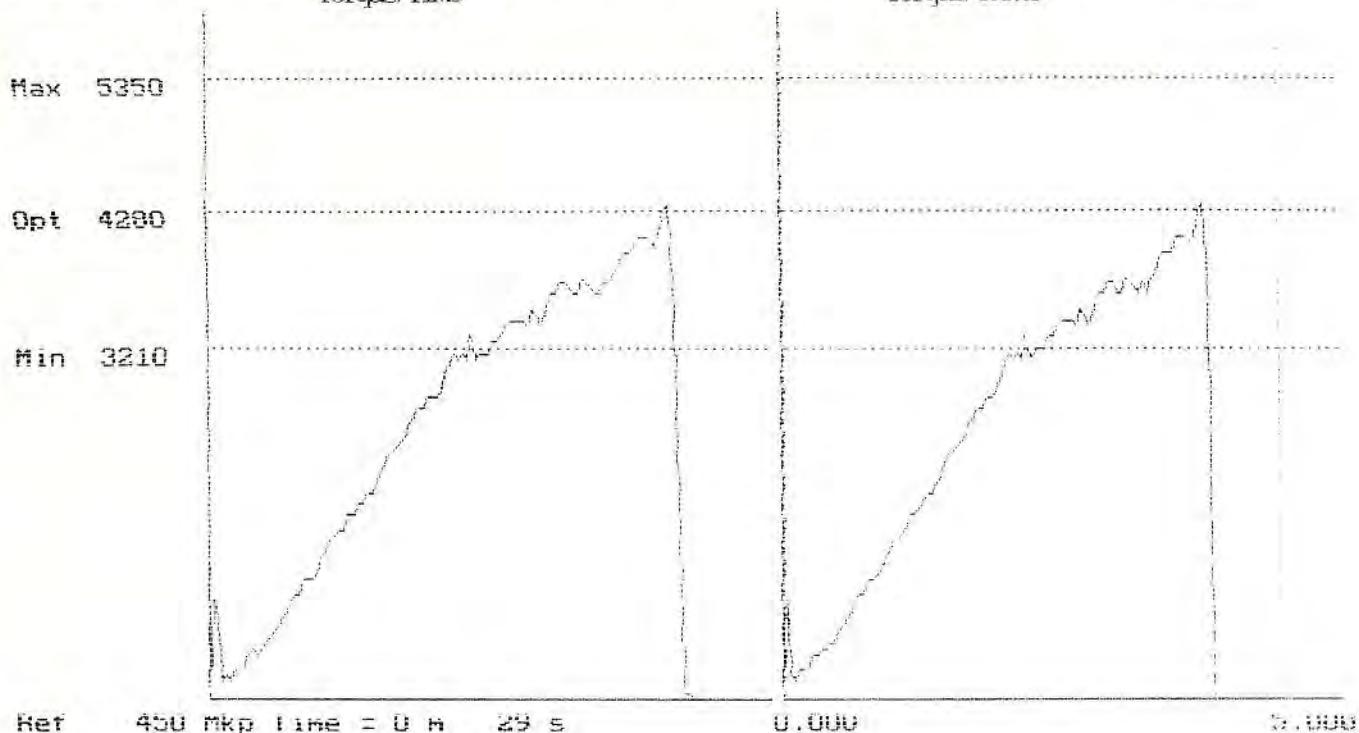


Applied Torque = 4298 Top Turns = 4.128

Comments:OK TU

WEATHERFORD JAM SERVICES

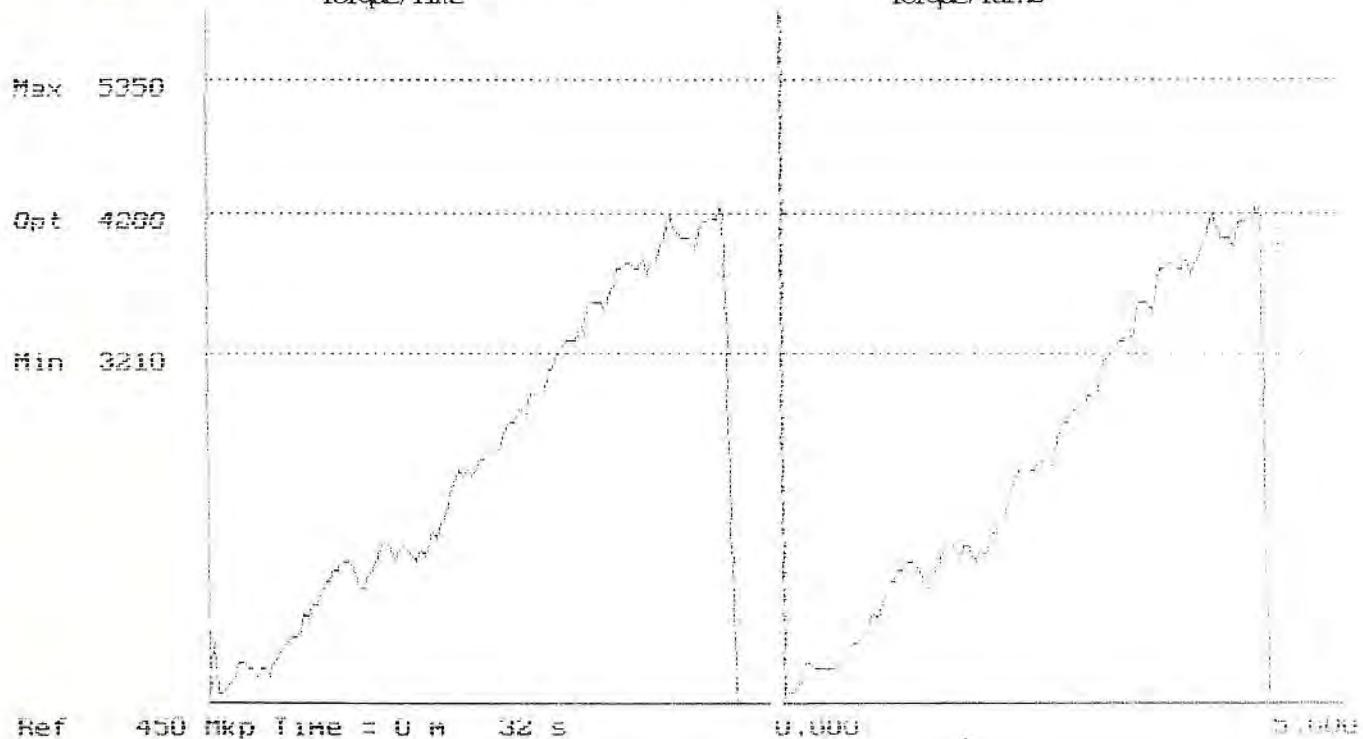
08:18 03/08/94 ACCEPT Joint # = 71 Log # = 71 Red String LHC 5 1/2 20# N-80
 Torque/Time Torque/Turns



Applied Torque = 4298 Top Turns = 4.266

Comments:OK TU

08:21 03/08/94 ACCEPT Joint # = 72 Log # = 72 Red String LHC 5 1/2 20# N-80
 Torque/Time Torque/Turns

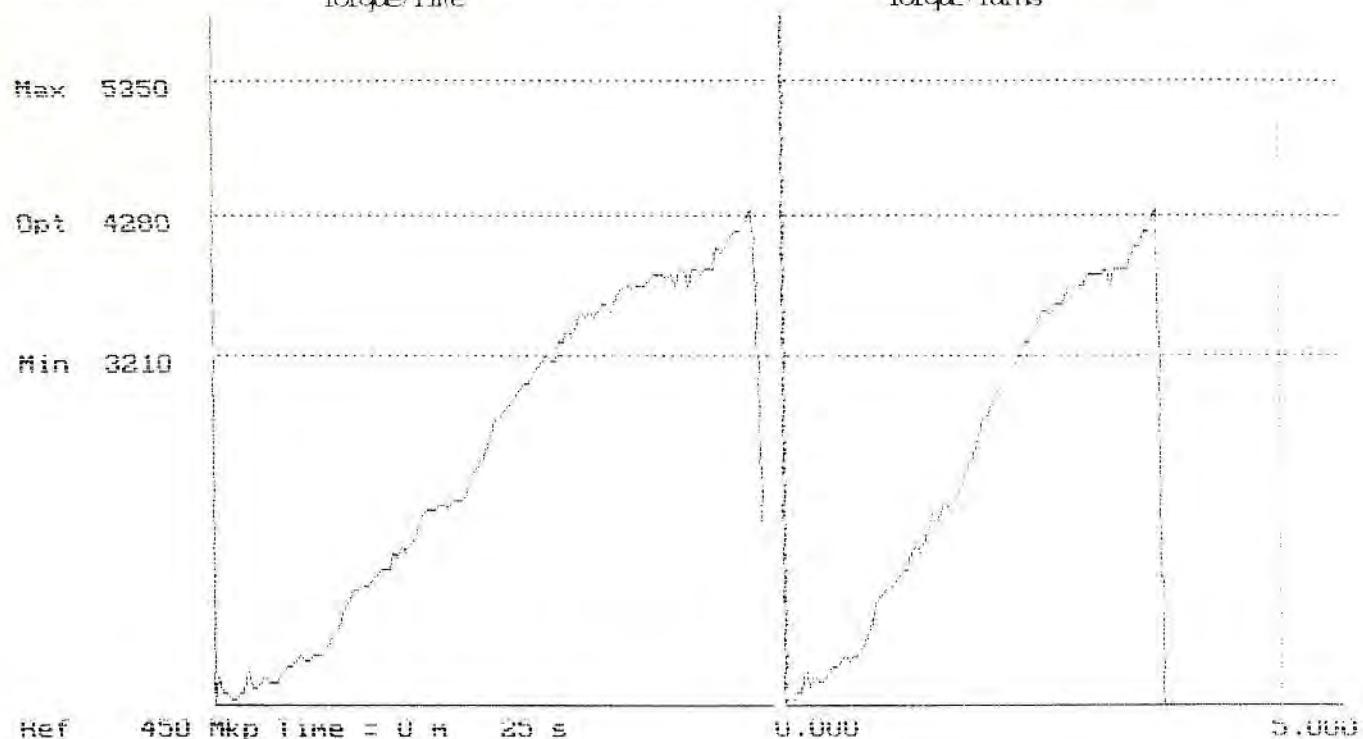


Applied Torque = 4352 Top Turns = 4.787

Comments:OK TU (ELEVATOR PULLING ON PIPE)

WEATHERFORD JAM SERVICES

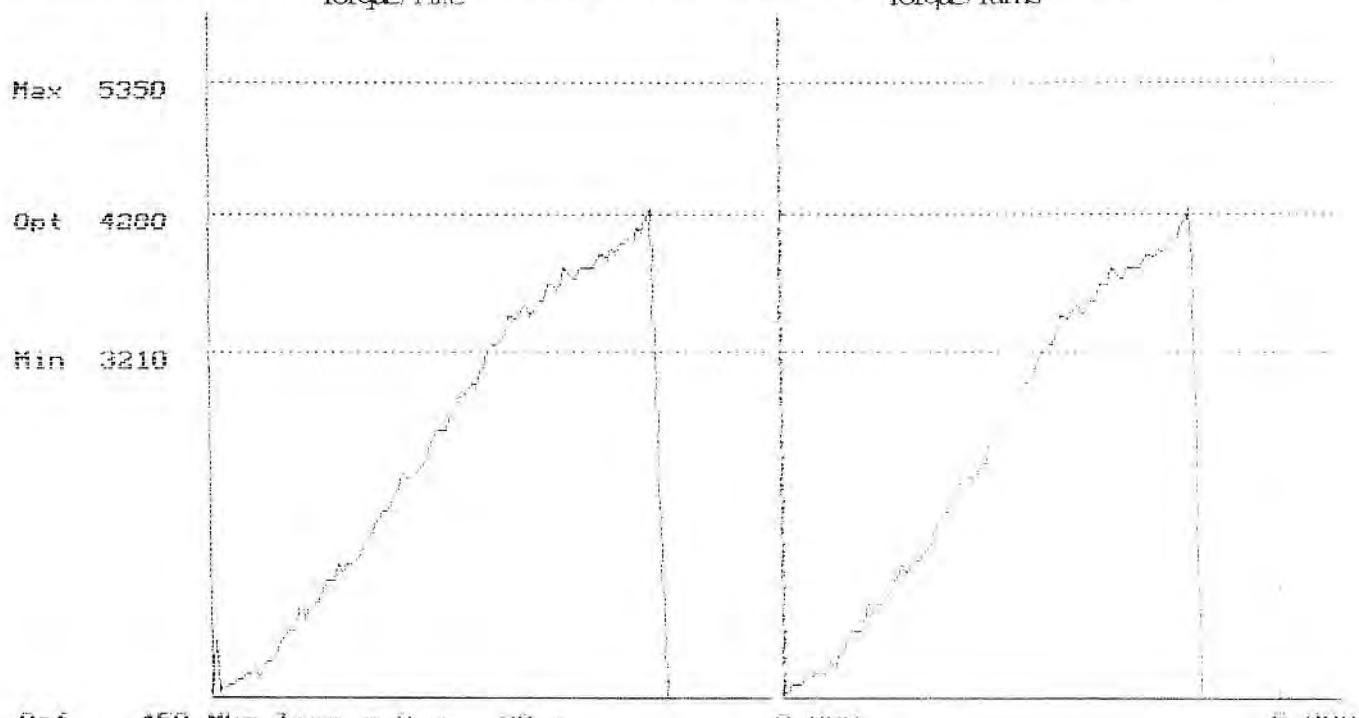
08:30 03/08/94 ACCEPT Joint # = 73 Log # = 73 Red String LTC 5 1/2 20# N-80
 Torque/Time Torque/Turns



Applied Torque = 4314 Top Turns = 3.769

Comments:OK BV

08:33 03/08/94 ACCEPT Joint # = 74 Log # = 74 Red String LTC 5 1/2 20# N-80
 Torque/Time Torque/Turns

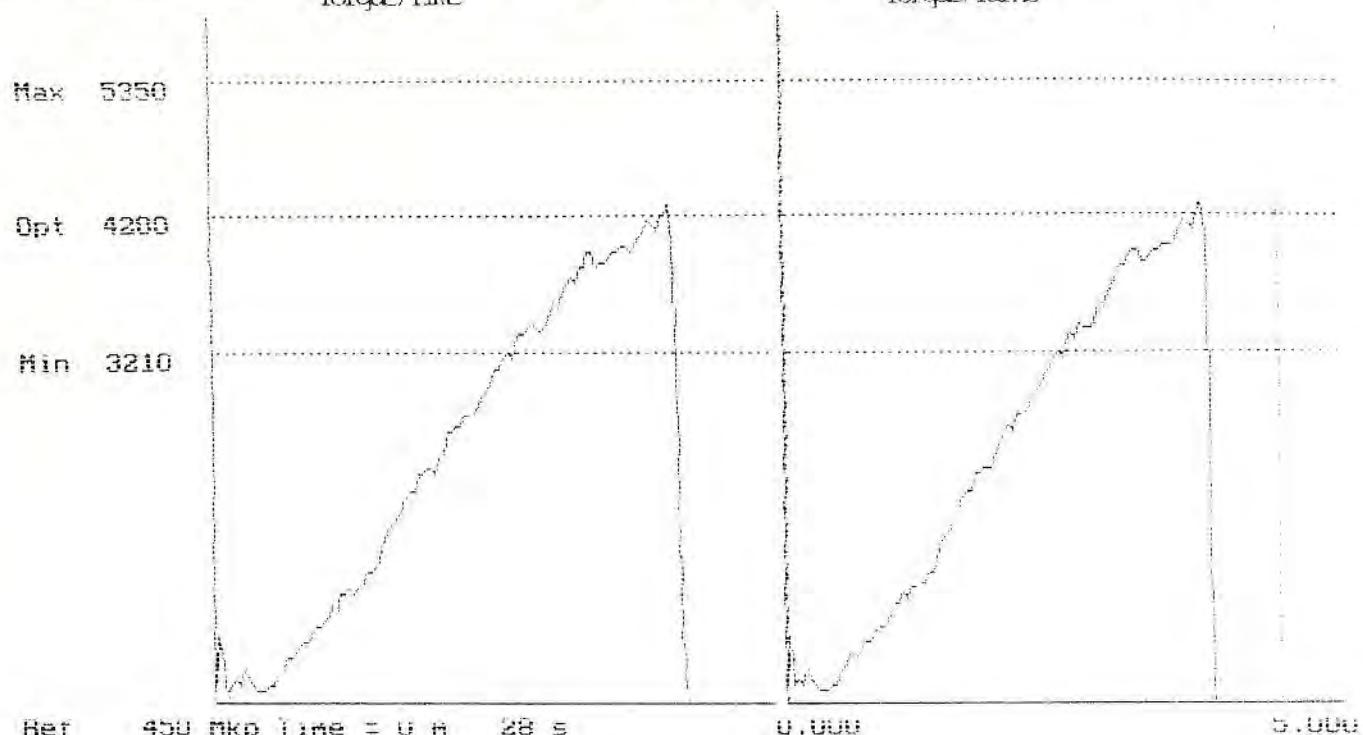


Applied Torque = 4305 Top Turns = 4.133

Comments:OK TU

WEATHERFORD JAM SERVICES

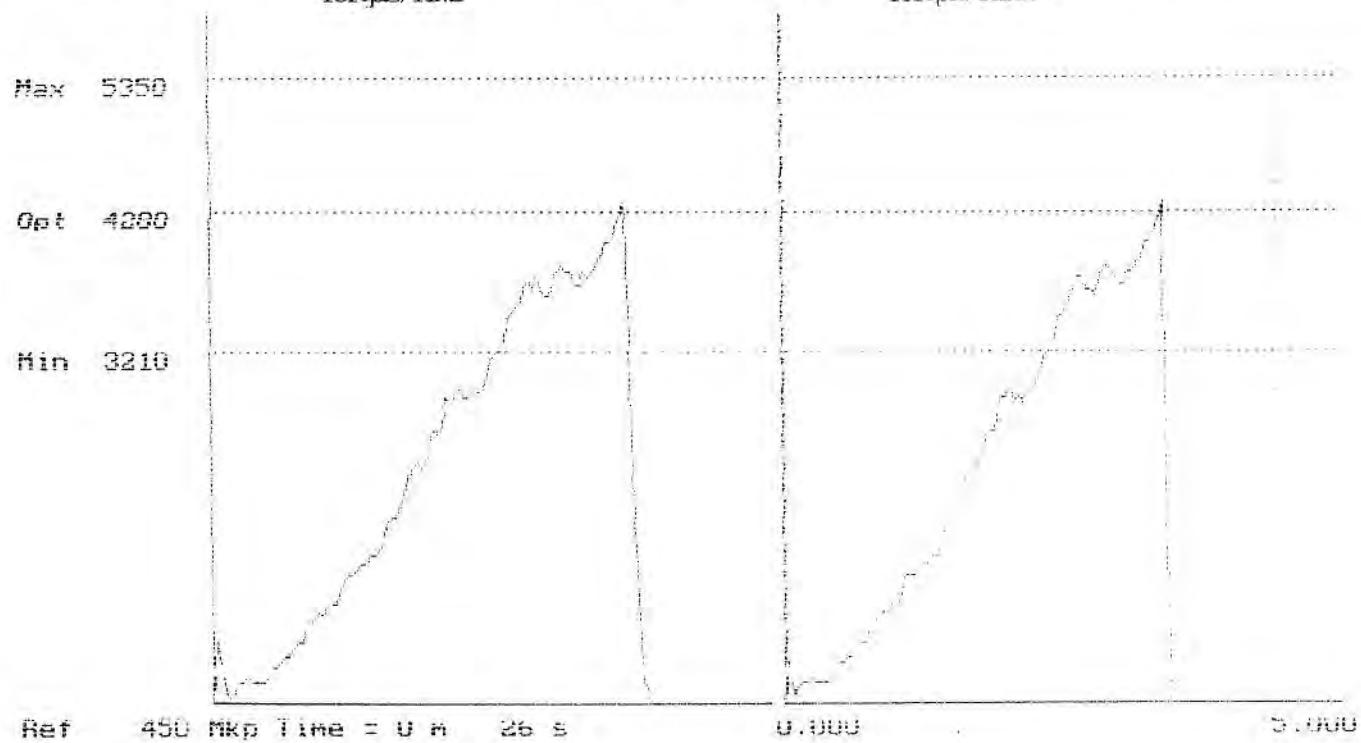
08:36 03/08/94 ACCEPT Joint # = 75 Log # = 75 Red String LIC 5 1/2 20# N=80
 Torque/Turns Torque/Turns



Applied Torque = 4365 Top Turns = 4.268

Comments:OK TU

08:40 03/08/94 ACCEPT Joint # = 76 Log # = 76 Red String LIC 5 1/2 20# N=80
 Torque/Turns Torque/Turns

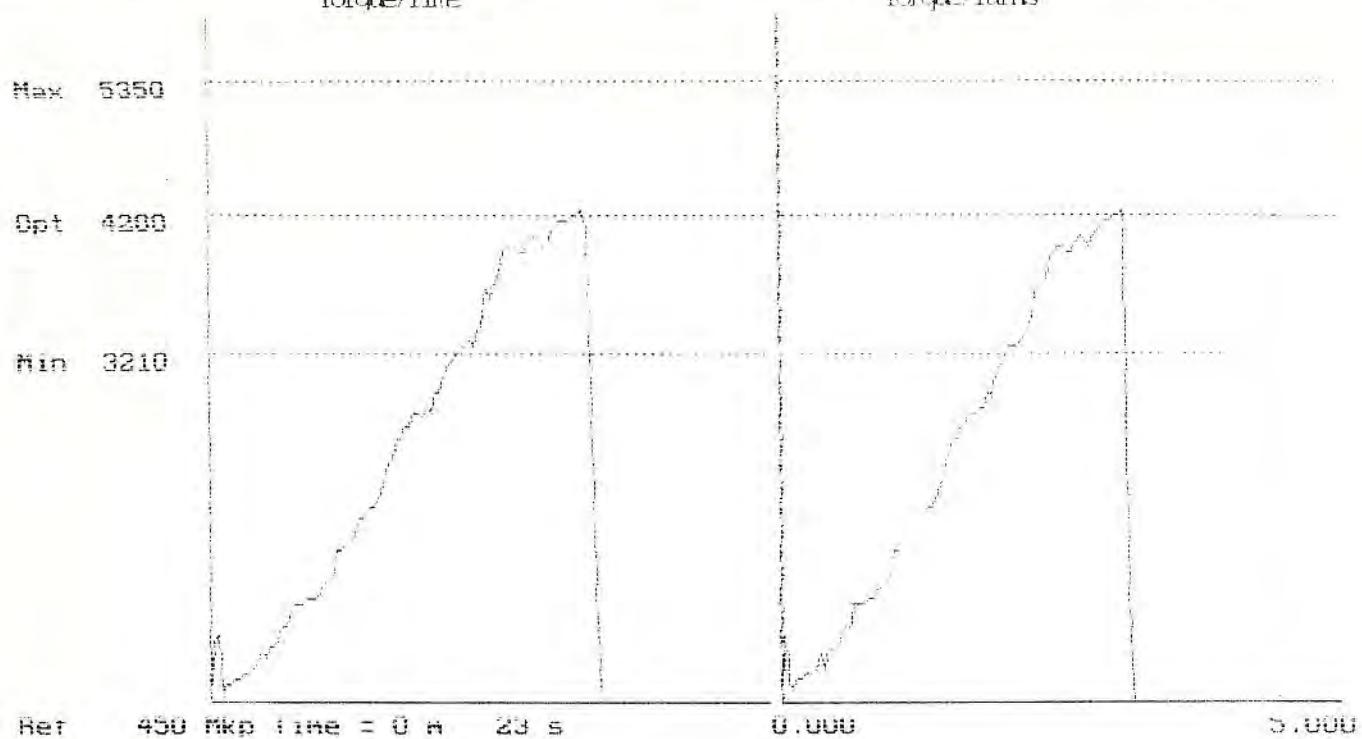


Applied Torque = 4365 Top Turns = 3.865

Comments:OK TU

WEATHERFORD JAM SERVICES

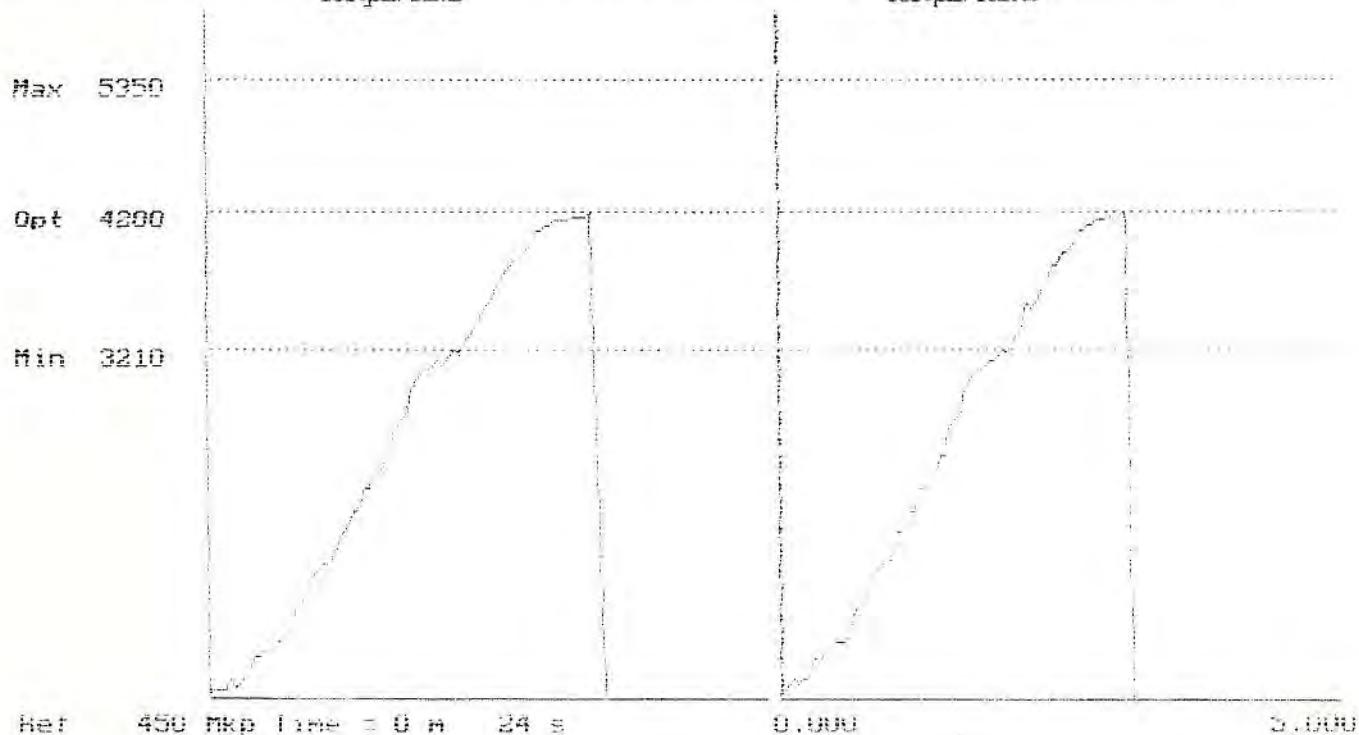
08:43 03/08/94 ACCEPT Joint # = 77 Log # = 77 Red String LHC 5 1/2 20# N=80
 Torque/Time Torque/Turns



Applied Torque = 4305 Top Turns = 3.484

Comments:OK TU

08:47 03/08/94 ACCEPT Joint # = 78 Log # = 78 Red String LHC 5 1/2 20# N=80
 Torque/Time Torque/Turns

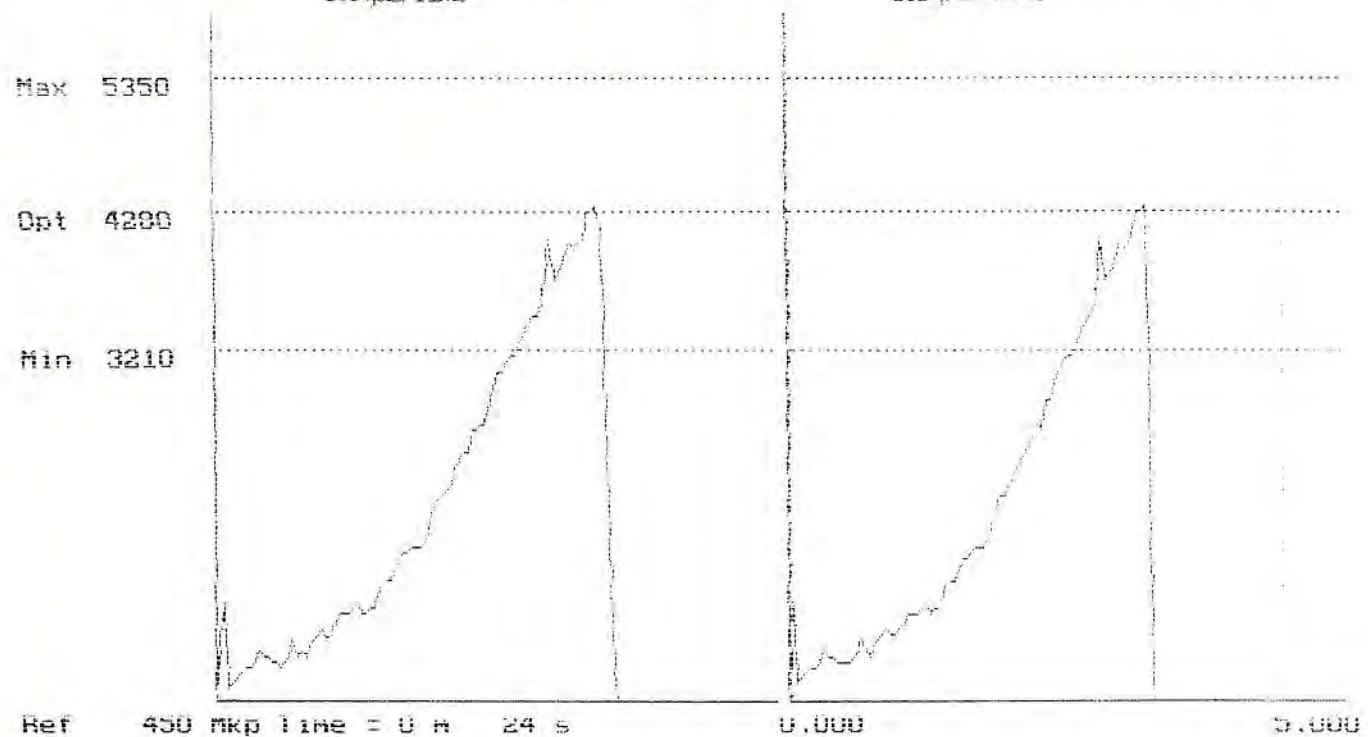


Applied Torque = 4272 Top Turns = 3.496

Comments:OK TU

WEATHERFORD JAM SERVICES

08:51 03/08/94 ACCEPT Joint # = 79 Log # = 79 Red String LRU 5 1/2 20# N=80
Torque/Time Torque/Turns



Ref 430 MPa Time = 0 s 24 s

Applied Torque = 4305 Top Turns = 3.643

Comments:OK TU

ECO Solutions, Inc.

Environmental Engineering and Technical Services

**APPENDIX B - MAGNELOG SURVEY
ON WDW-49 (WELL NO. 4)
WITH WESTERN ATLAS
INTERPRETATION LETTER**

MAGNELOG (CASING INSPECTION)

Hoechst Celanese Chemical Group, Inc.
Well #4
Bay City Plant
Matagorda County, Texas

Prepared for
ECO Solutions, Inc.
Houston, Texas

ATLAS WIRELINE SERVICES
WESTERN ATLAS INTERNATIONAL

March 5, 1994

Prepared by Freeman Hill, III

DISCLAIMER

In making interpretations of logs, our employees will give Customer the benefit of their best judgement, but since all interpretations are opinions based on inferences from electrical or other measurements, we cannot, and we do not guarantee the accuracy or the correctness of any interpretation. We shall not be liable or responsible for any loss, cost, damages, or expenses whatsoever incurred or sustained by the Customer resulting from any interpretation made/by any of our employees.



ATLAS WIRELINE SERVICES

Disposal Well Background

The Hoechst Celanese Chemical Group, Inc.'s Injection Well #4, located at the Bay City facility has been used for underground injection. In addition to surface casing string, the well contains 10-3/4" OD casing cemented down to 1,385 ft, and a string of 7-5/8 inch OD casing cemented to 3368 ft.

A logging program consisting of a Magnelog instrument was used to evaluate the integrity of the casing.

The Magnelog is an electromagnetic casing inspection log. The instrument uses a transmitter and a receiver which are located approximately 2 feet apart. The transmitter relays a signal to the receiver, and based on the frequency shift of the original signal, determines the amount of metal present. Thus, when the Phase Curve, located on the right hand side of the log, moves to the right or more phase shift, the greater the metal mass is and vice versa.

On the left side of the log is an Anomaly Indicator Detector (A.I.D.) which responds to internal defects or anomalies if present. All the collars should be seen with this measurement since the collar connections have uneven surfaces.

Magnelog Survey

1. Logged Magnelog from 3300 ft. to 3082 ft.

Purpose: Repeat section to help determine if the tool is within statistics.

Analysis: When compared to the main logging pass, ran next, the repeat was satisfactory.

2. Logged Magnelog from well depth of 3300 ft. to surface.

Purpose: Casing Inspection.

Analysis: The area between 1392 ft. and 3300 ft. is single string, or just the 7-5/8" casing. The collars are showing up as increases in phase shift. The two increases that are seen are due to the increase in metal at the joint connections. The phase curve does decrease through some joints; however, there is no significant metal loss noted. On some of the joints of pipe (2100 ft.), we notice a decrease in phase shift moving down the joints of pipe. This response is usually related to the manufacturing operations of the pipe.

Above 1392 ft., there are two strings of pipe. In this area, the Magnelog is less responsive to metal loss and interpretation. When the tool gets used in two strings of pipe, the amount metal and attenuation of the signal, the phase curve can move around, not responding to the pipe accurately. For this reason, I will not comment on this section.

Magnelog (Casing Inspection)(Cont.)
Hoecsht Celanese Chemical Group, Inc. Well #4
Page 2

Conclusion:

In my opinion, the Hoecsht Celanese Well #4, located in the Bay City Plant, does not have casing integrity problems that would result in disposed fluids moving into intervals other than the injection zone which would be due to casing corrosion.



**ATLAS
WIRELINE
SERVICES**

MAGNELOG

FILE NO. **94060**
API NO.

COMPANY **CELANESE CHEMICAL COMPANY INC.**
WELL **EFFLUENT DISPOSAL WELL NO. 4**
FIELD **CELANESE PLANT**

COUNTY **MATAGORDA**
STATE **TX.**

LOCATION:
BAY CITY PLANT

OTHER SERVICES
NONE

FINAL PRINT

PERMANENT DATUM	GL	ELEV.	N/A
LOGGING MEASURED FROM	KB	FT. ABOVE P.D.	12
DRILLING MEASURED FROM	KB		

DATE	3-5-94	ELEVATIONS	
RUN	1	KB	N/A
SERVICE ORDER	131217	DF	N/A
DEPTH-DRILLER	3300B	NA	N/A
DEPTH-LOGGER	3300B		
BOTTOM LOGGED INTERVAL	3302		
TOP LOGGED INTERVAL	20		
TYPE FLUID IN HOLE	BRINE		
SALINITY RPM GL.	N/A		
DENSITY LB/GAL.	N/A		
LEVEL	FULL		
MAX. REC. TEMP. DEG. F	N/A		
OPR. RIG TIME	2.5 HRS.		
EQUIP. NO. / LOC.	6301	HOUSTON	
RECORDED BY	T. FERGUSON		
WITNESSED BY	MR. BOB HALL		
BOREHOLE RECORD	10		

IN MAKING INTERPRETATIONS OF LOGS OUR
EMPLOYEES WILL GIVE CUSTOMER THE BENE-
FIT OF THEIR BEST JUDGEMENT, BUT SINCE
ALL INTERPRETATIONS ARE OPINIONS BASED
ON INFERENCES FROM ELECTRICAL OR OTHER
MEASUREMENTS, WE CANNOT, AND WE DO NOT
GUARANTEE THE ACCURACY OR CORRECTNESS
OF ANY INTERPRETATION. WE SHALL NOT BE
LIBLE OR RESPONSIBLE FOR ANY LOSS,
COST, DAMAGES, OR EXPENSES WHATSOEVER
INCURRED OR SUSTAINED BY THE CUSTOMER
RESULTING FROM ANY INTERPRETATION MADE
BY ANY OF OUR EMPLOYEES.

FOLD HERE

REMARKS RUN (1)

EQUIPMENT DATA

RUN	TRIP	TOOL	SERIAL NO.	SERIES NO.	POSITION
1	1	MFC			
1	1	MAG	070654	2918XB	CENT.

EQUIPMENT DATA

RUN	TRIP	TOOL	SERIAL NO.	SERIES NO.	POSITION
1	1	MFC			
1	1	MAG	070654	2918XB	CENT..

***** FILE: 4 *****

CURVE DELAY REPORT

PHYS.	CURVE	DELAY	UNITS
PHAS		0	FT, IN
AMP		0	FT, IN
CAL		0	FT, IN
AID		5,6	FT, IN
CMIN		0	FT, IN
CMAX		0	FT, IN

PARAMETERS

NAME	DEPTH	INTERVAL	VALUE	UNITS
O.D.	3306	TO 18	0.000	INCH

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: WELL NO. 4

TRIP: 1

SERVICE: A 457A FILE: 4

DATE: 03/05/94

TIME: 10:04:25

REVISION: FSYS256 REV:G002 VER:2.0

MODE: RECORD

TEN (LBS)

1000

0

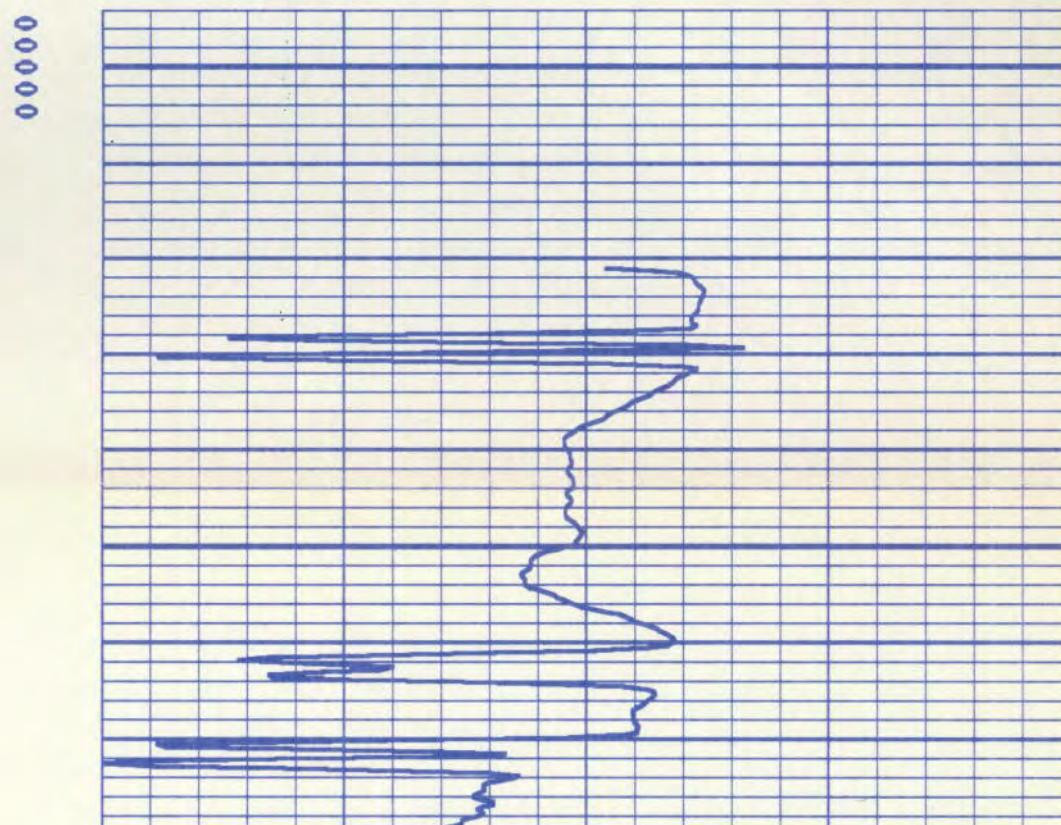
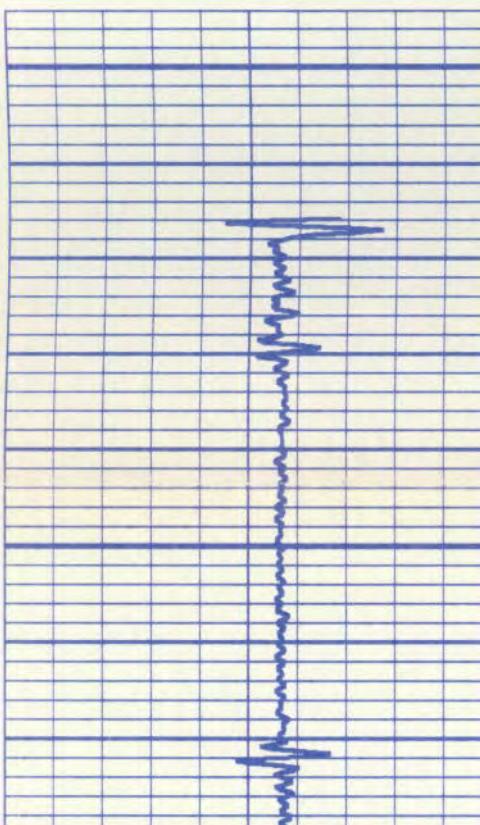
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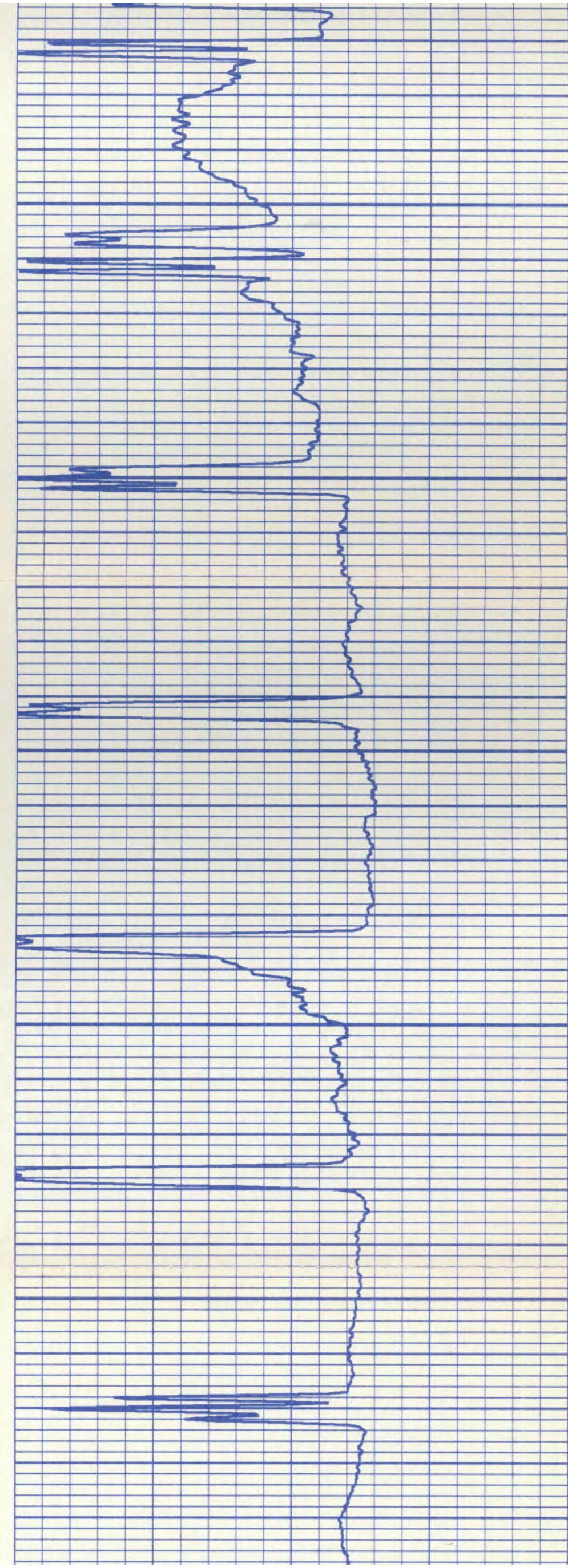
PHAS (DEG)

-100 100

120

300





00100

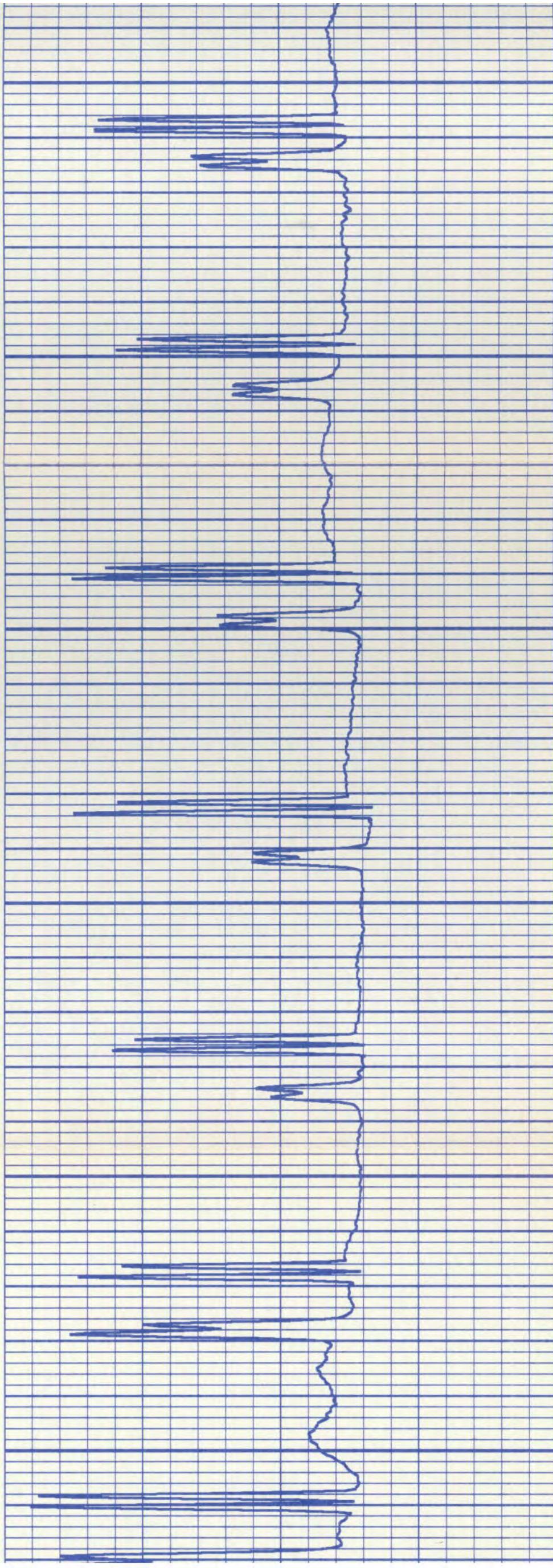
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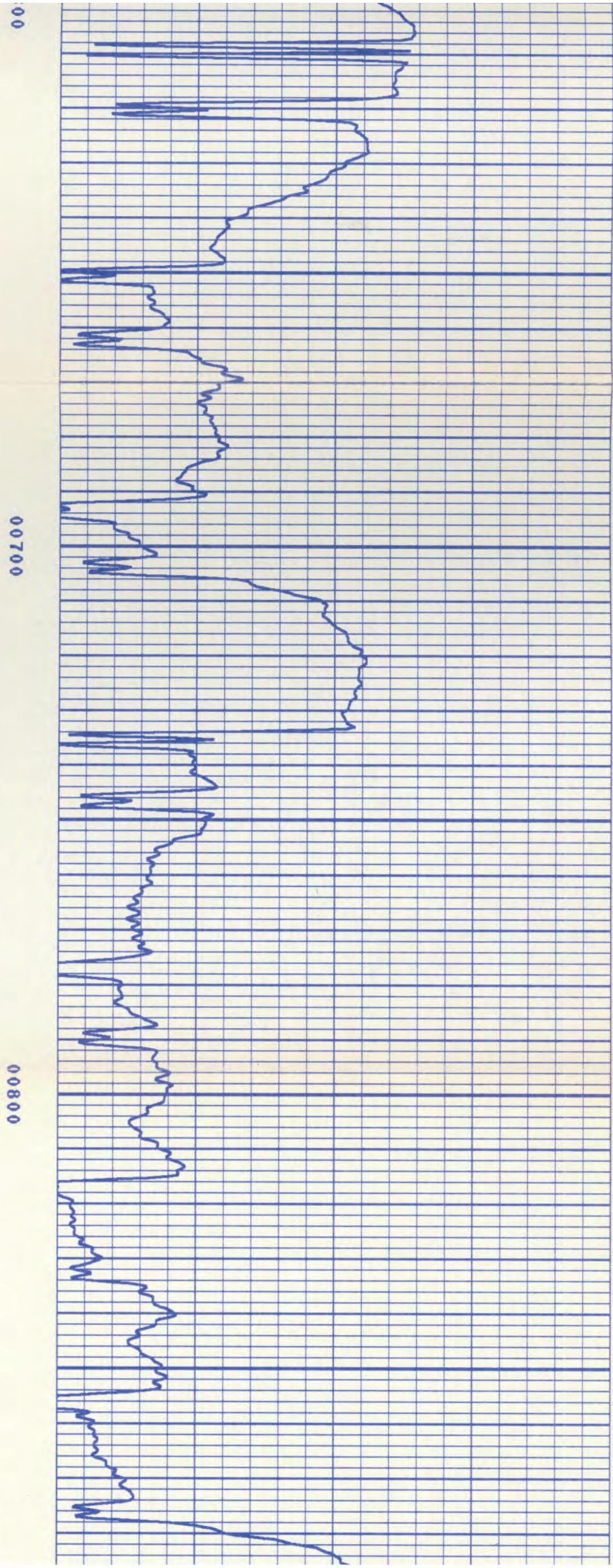
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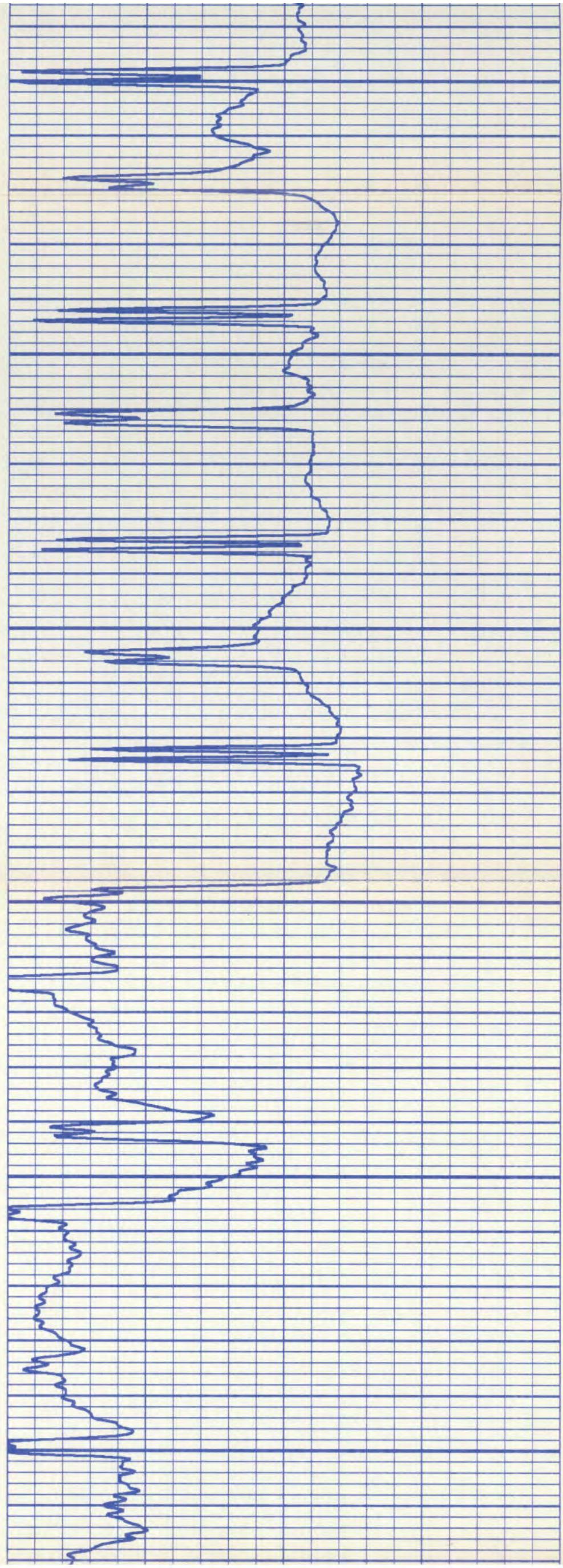
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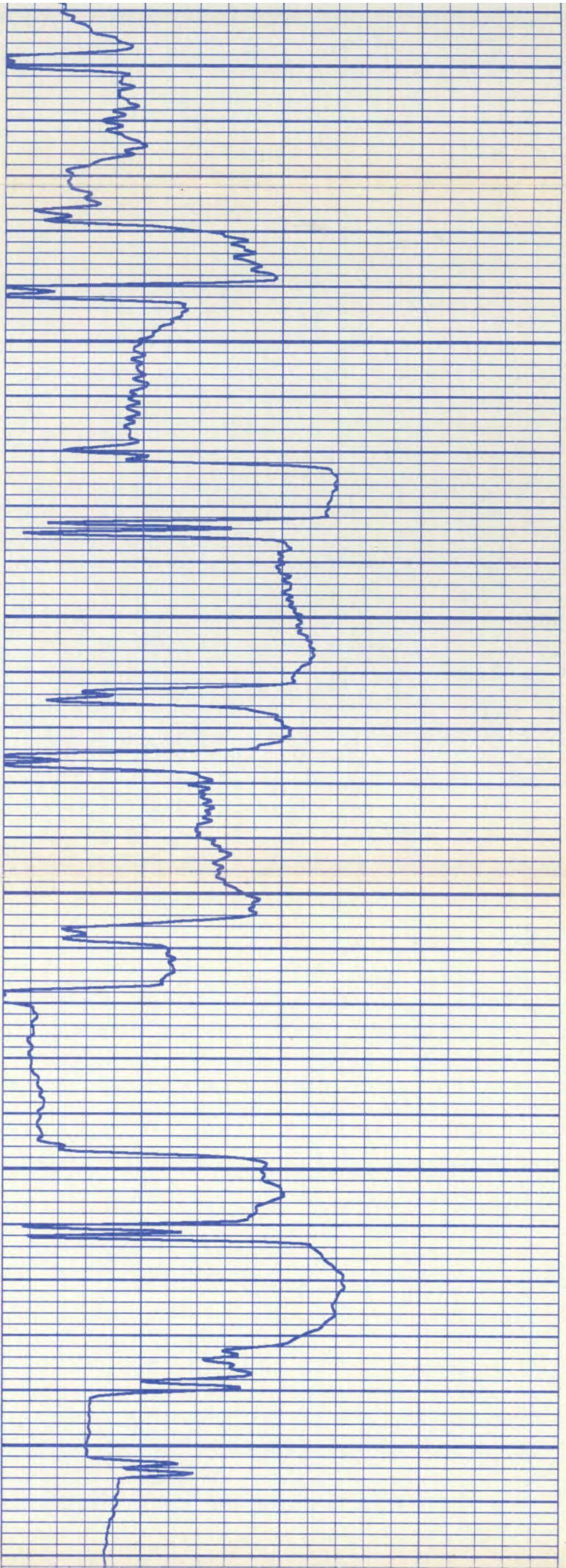
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00600





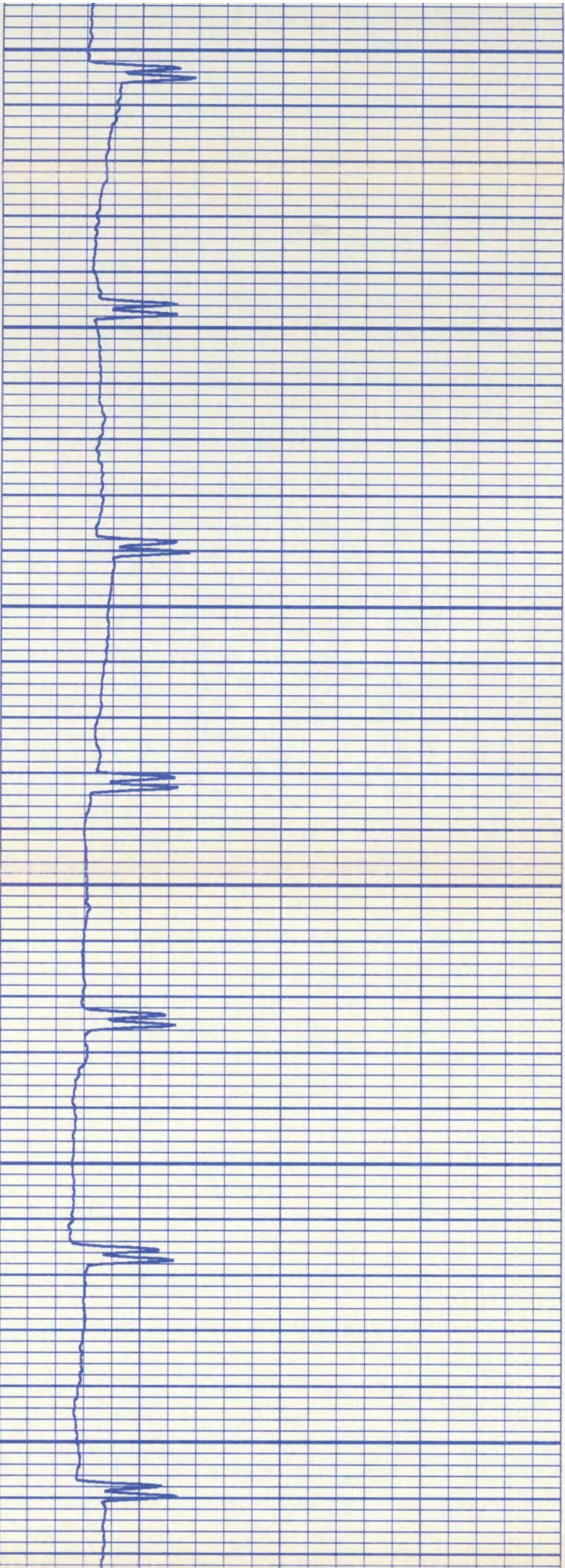




01200

01300

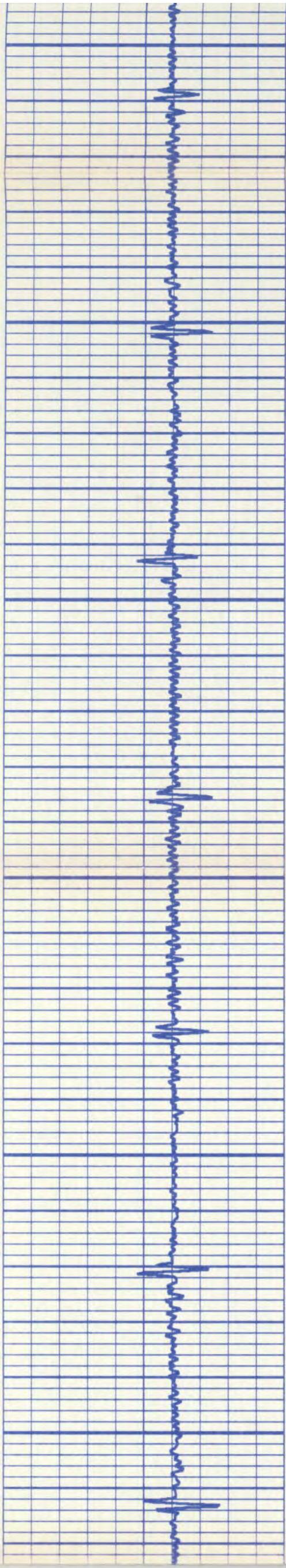
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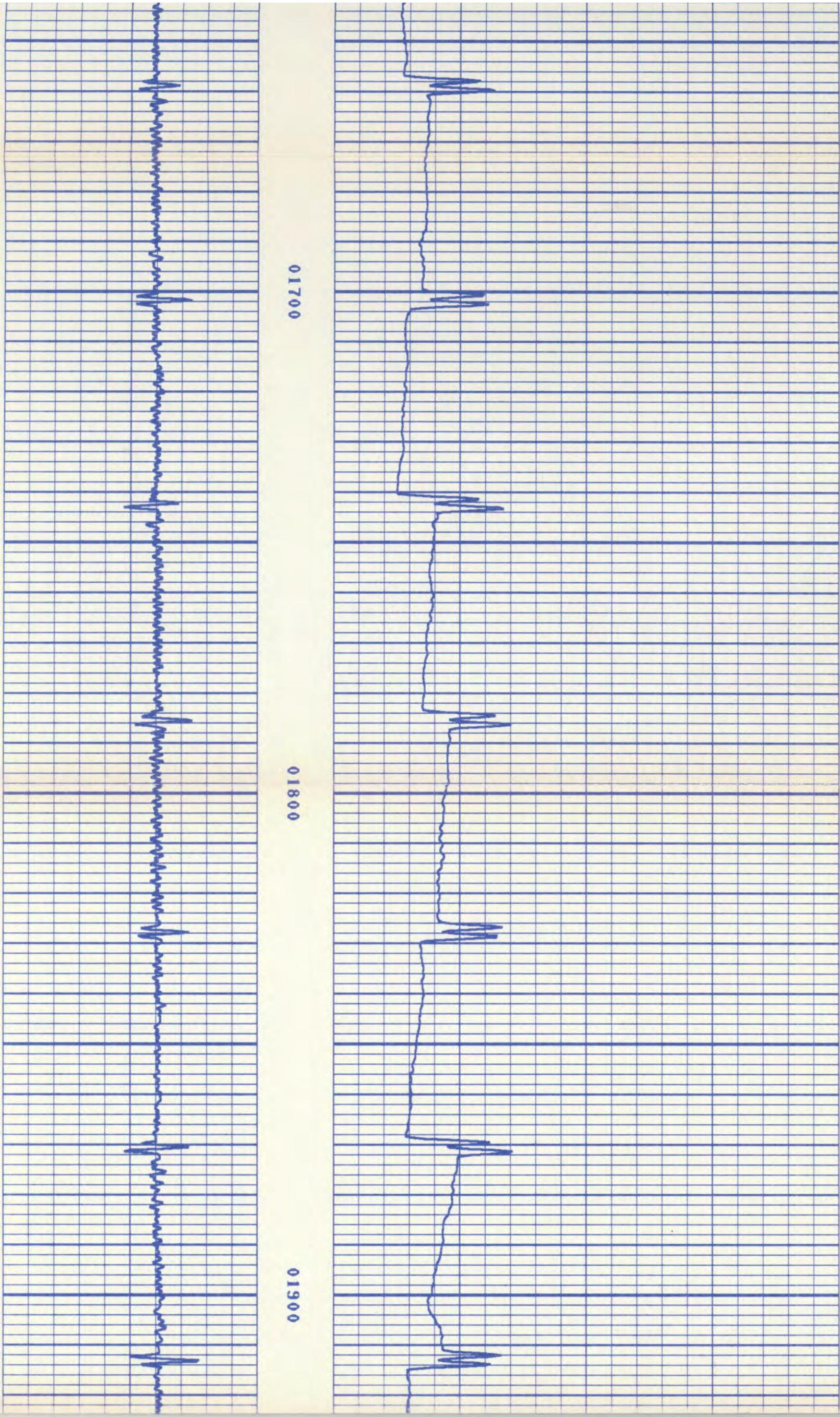
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01500

01600

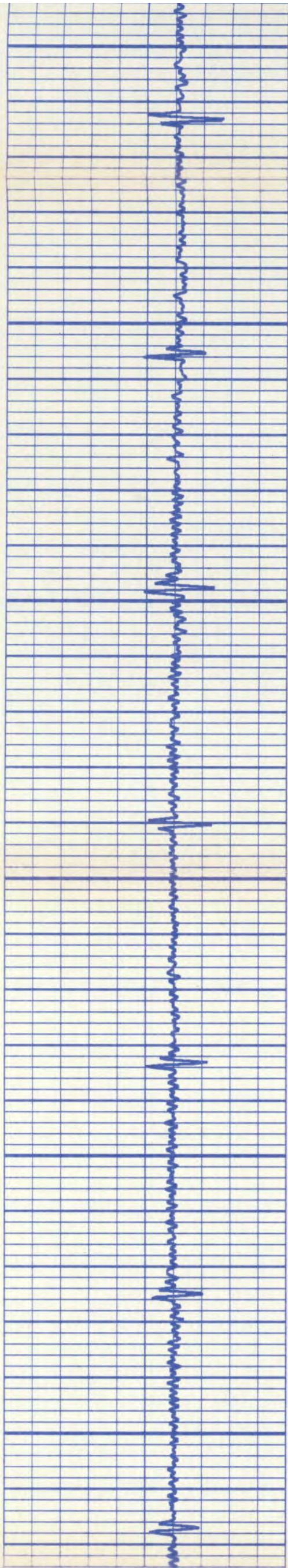


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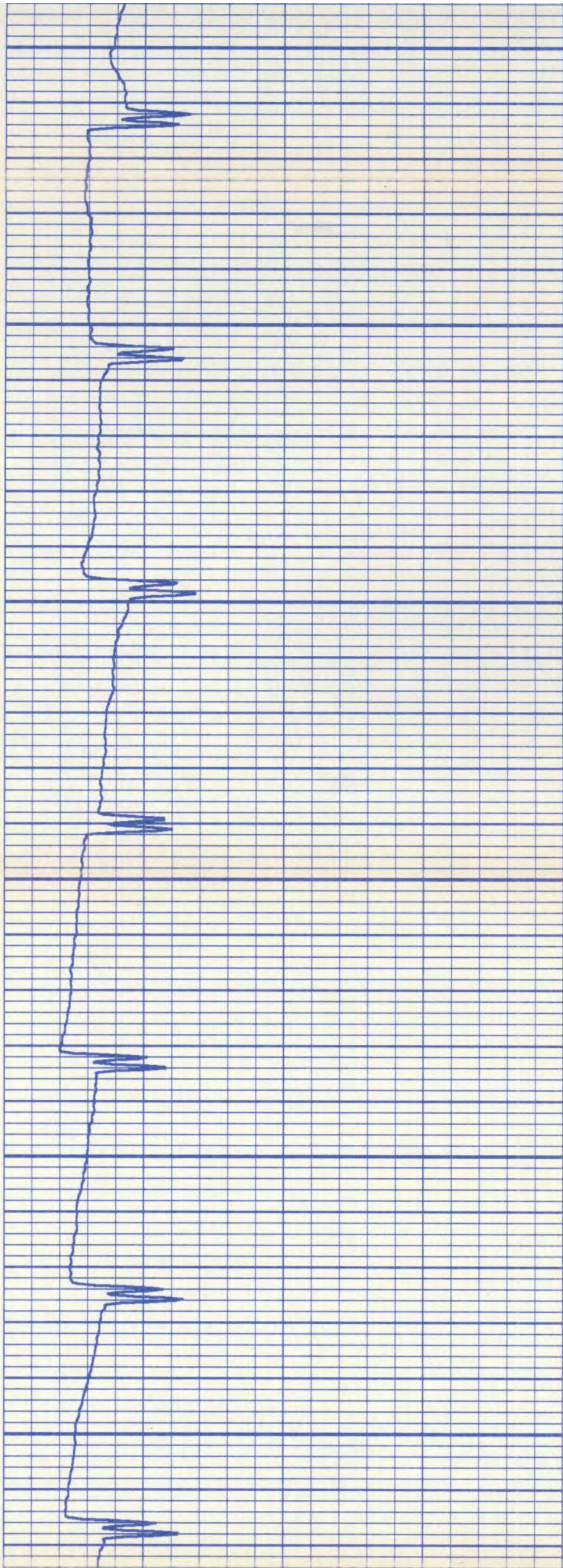
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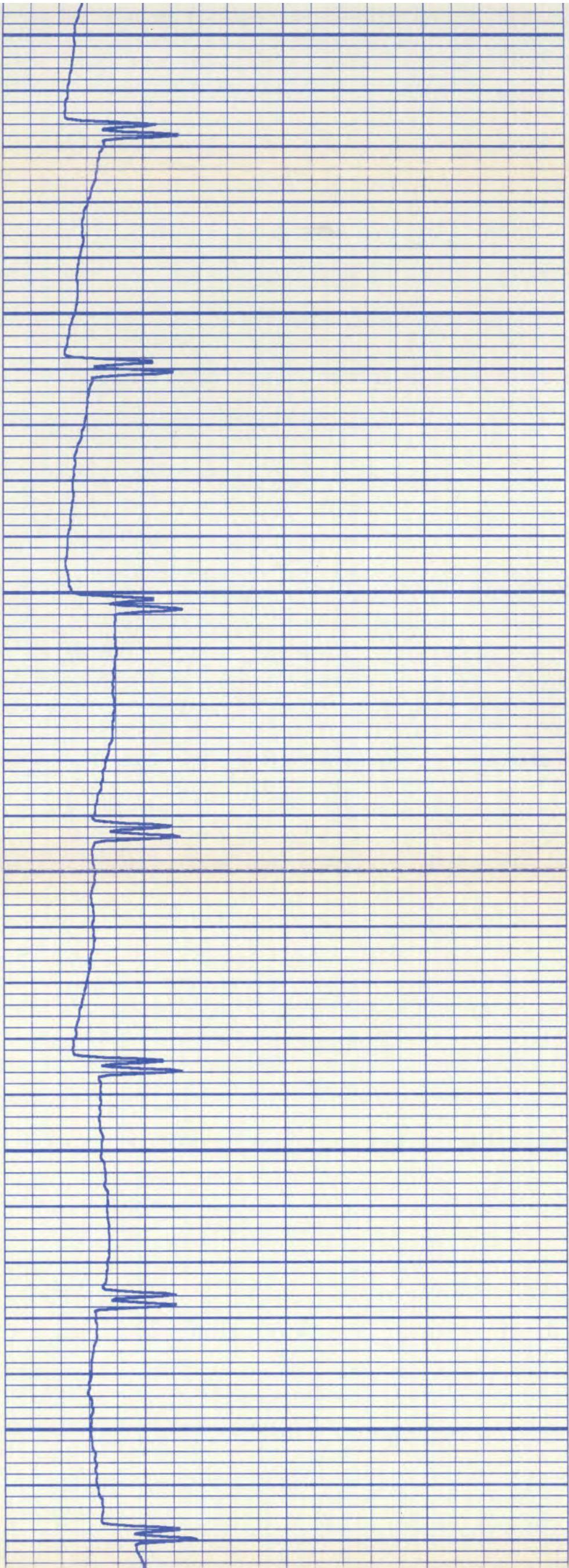


01900

02000

02100

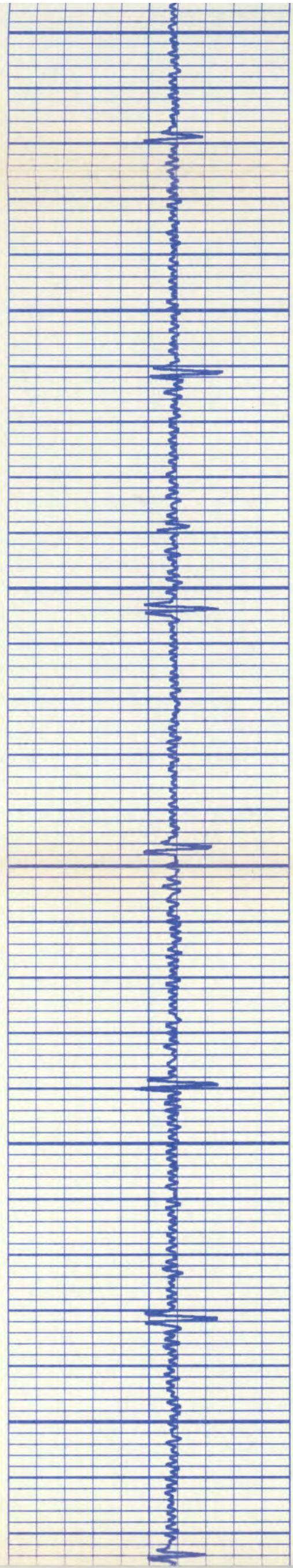




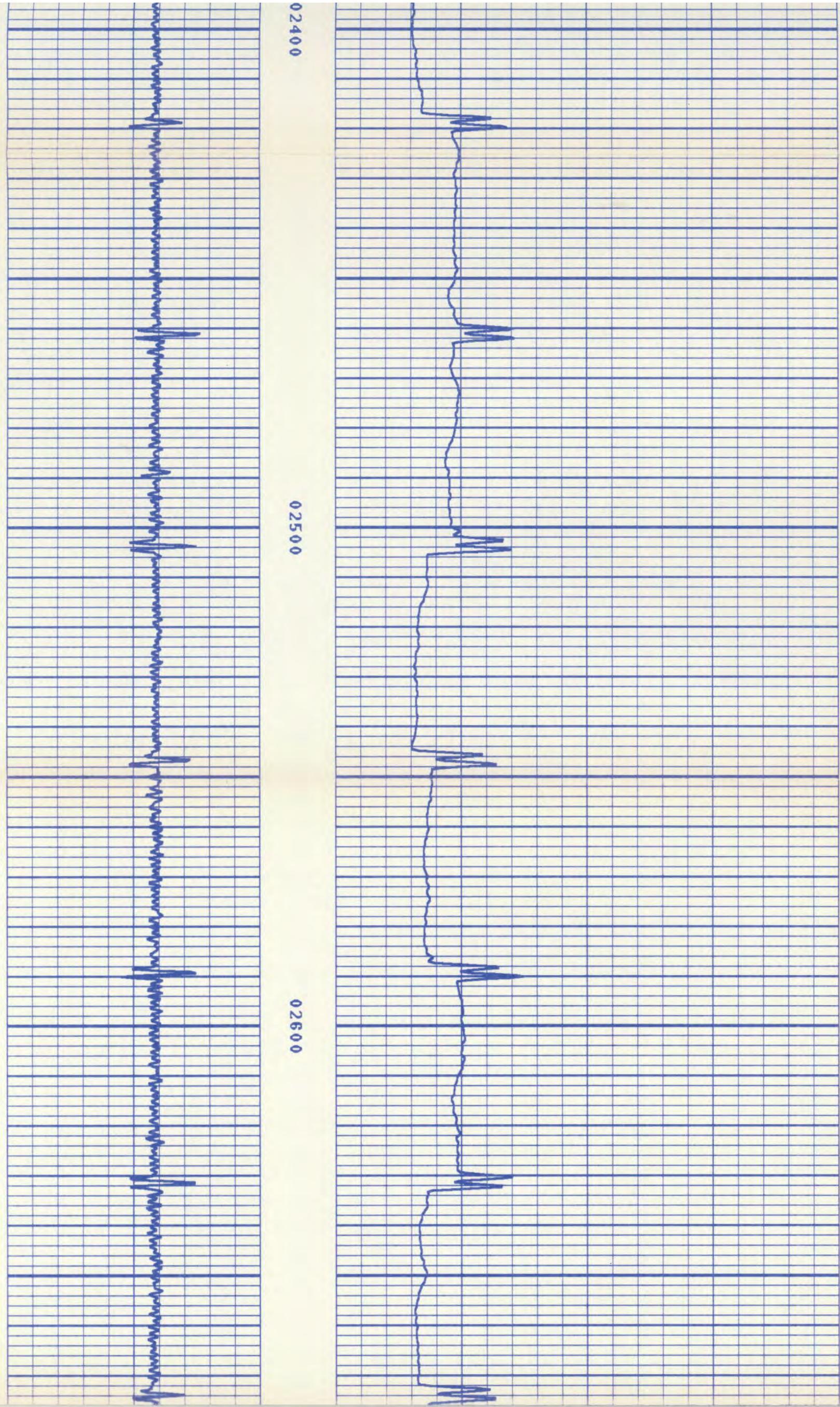
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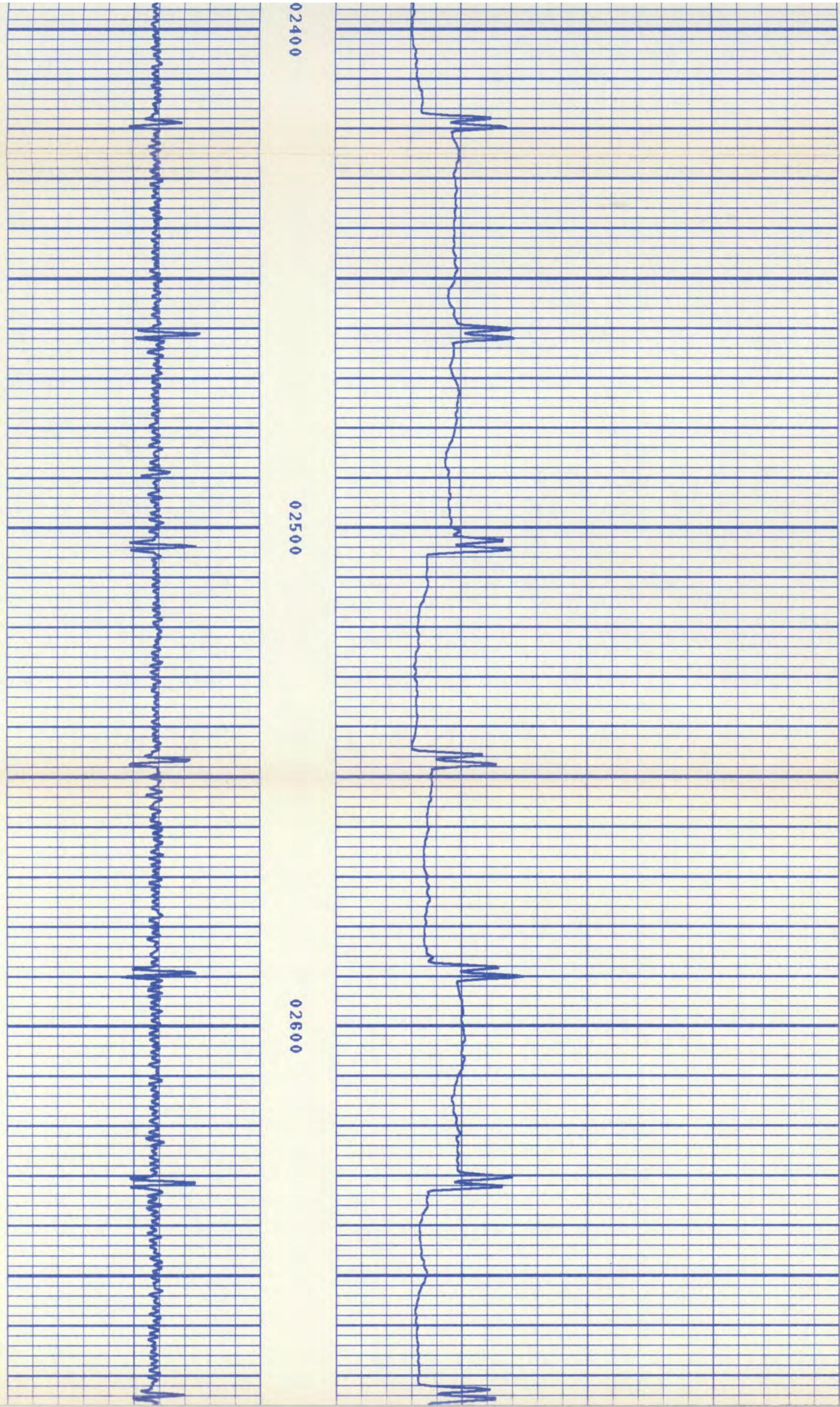
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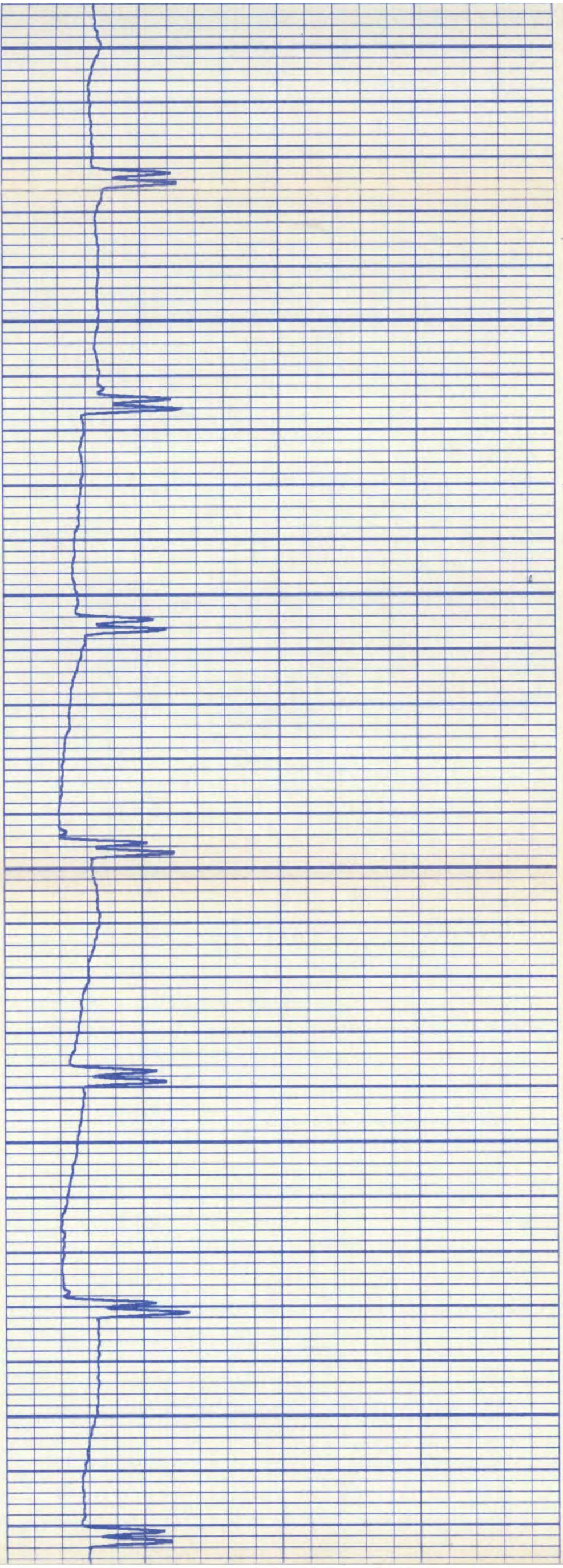
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02500



02600

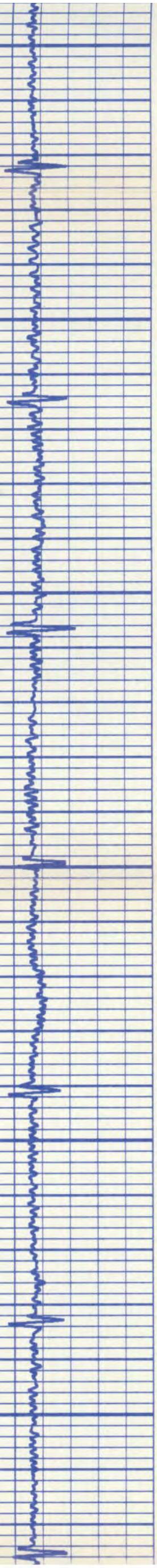


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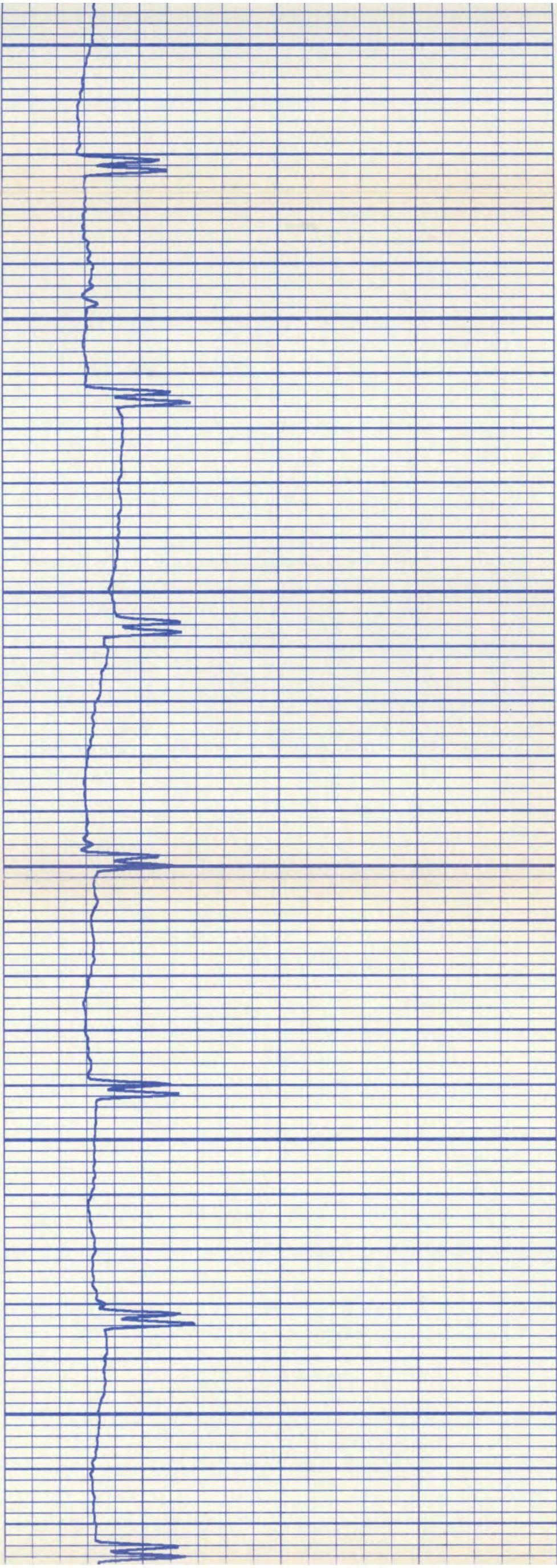
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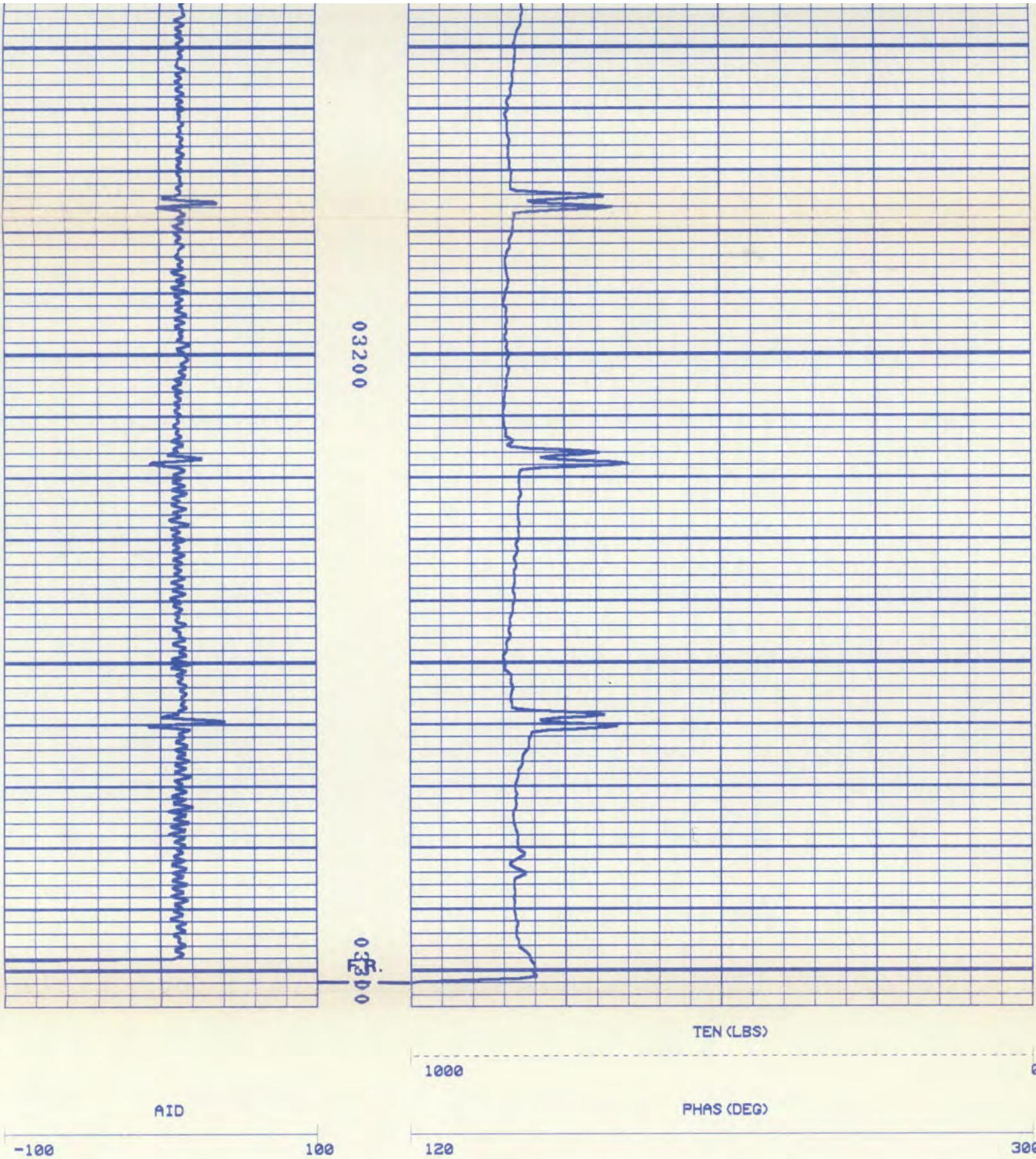
02900



03000



03100



REPEAT SECTION

FILE: 2

CURVE DELAY REPORT

CURVE	PHYS.	DELAY	UNITS
-----	-----	-----	-----

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
PHAS	0	FT,IN
AMP	0	FT,IN
CAL	0	FT,IN
AID	5,6	FT,IN
CMIN	0	FT,IN
CMAX	0	FT,IN

PARAMETERS

NAME	DEPTH INTERVAL	VALUE	UNITS
O.D.	3326 TO 3076	0.000	INCH

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: CELANESE CHEMICAL COMPANY INC.

RUN: 1

WELL NAME: WELL NO. 4

TRIP: 1

SERVICE: A 457A FILE: 2

DATE: 03/05/94

TIME: 09:53:22

REVISION: FSYS256 REV:G002 VER:2.0

MODE: RECORD

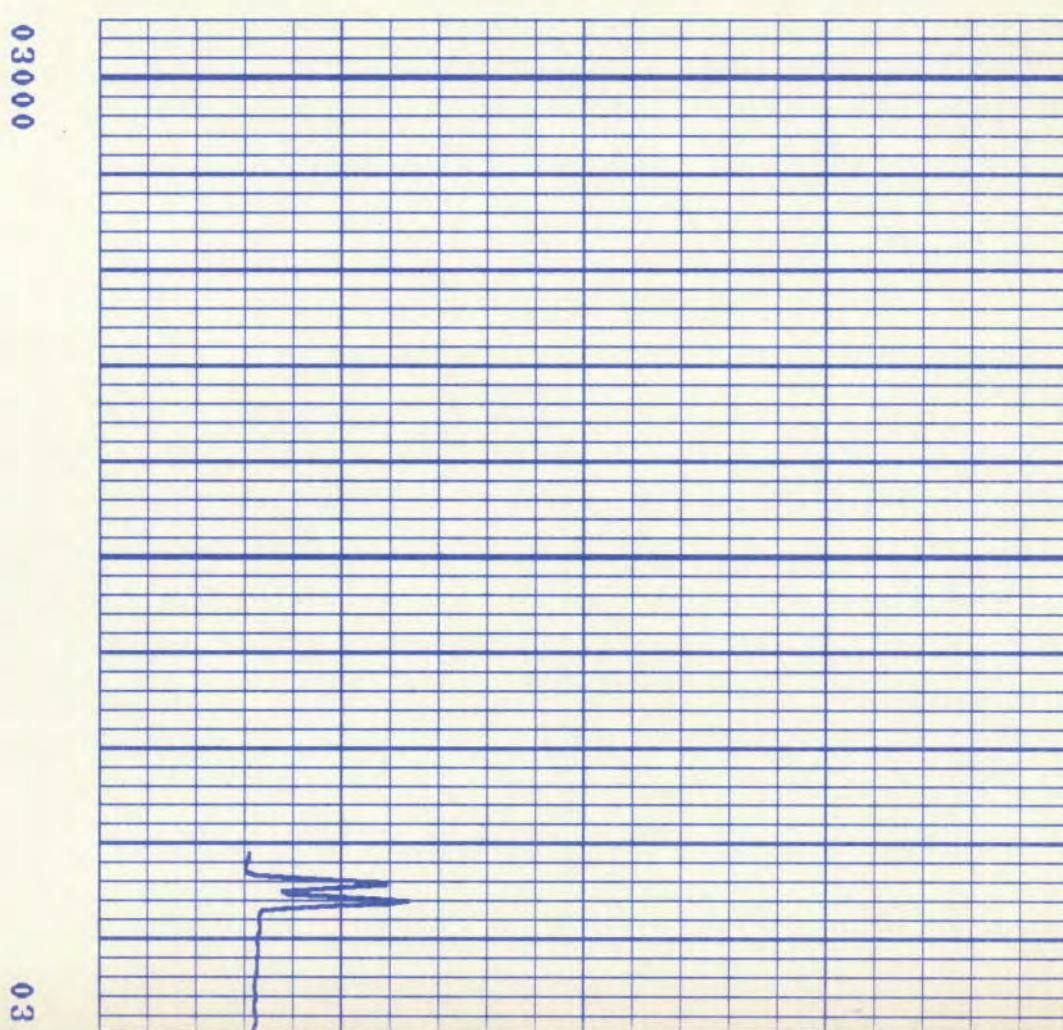
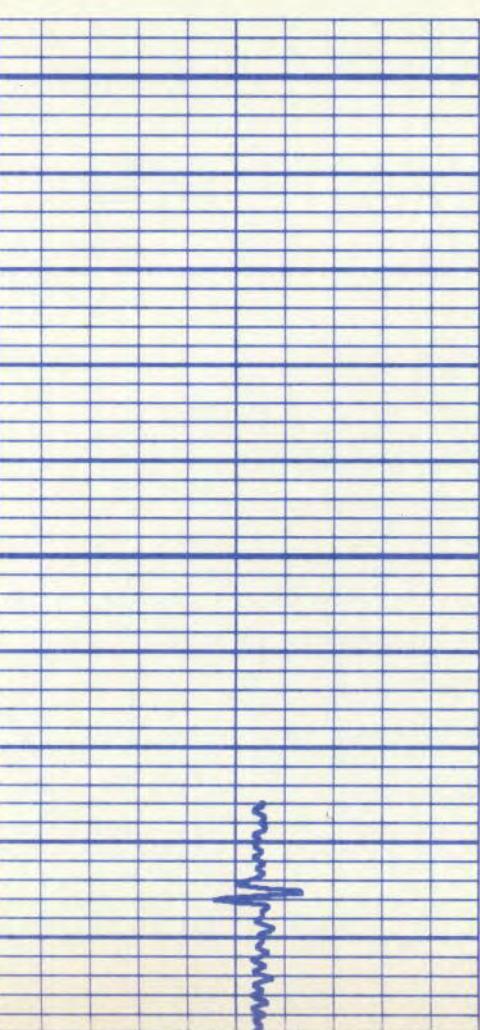
TEN (LBS)

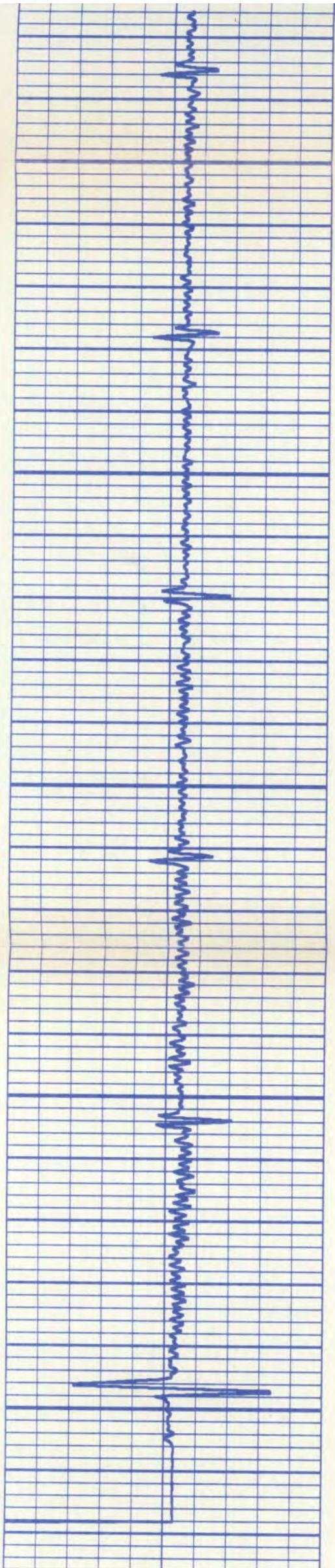
1000

0

AID

PHAS (DEG)

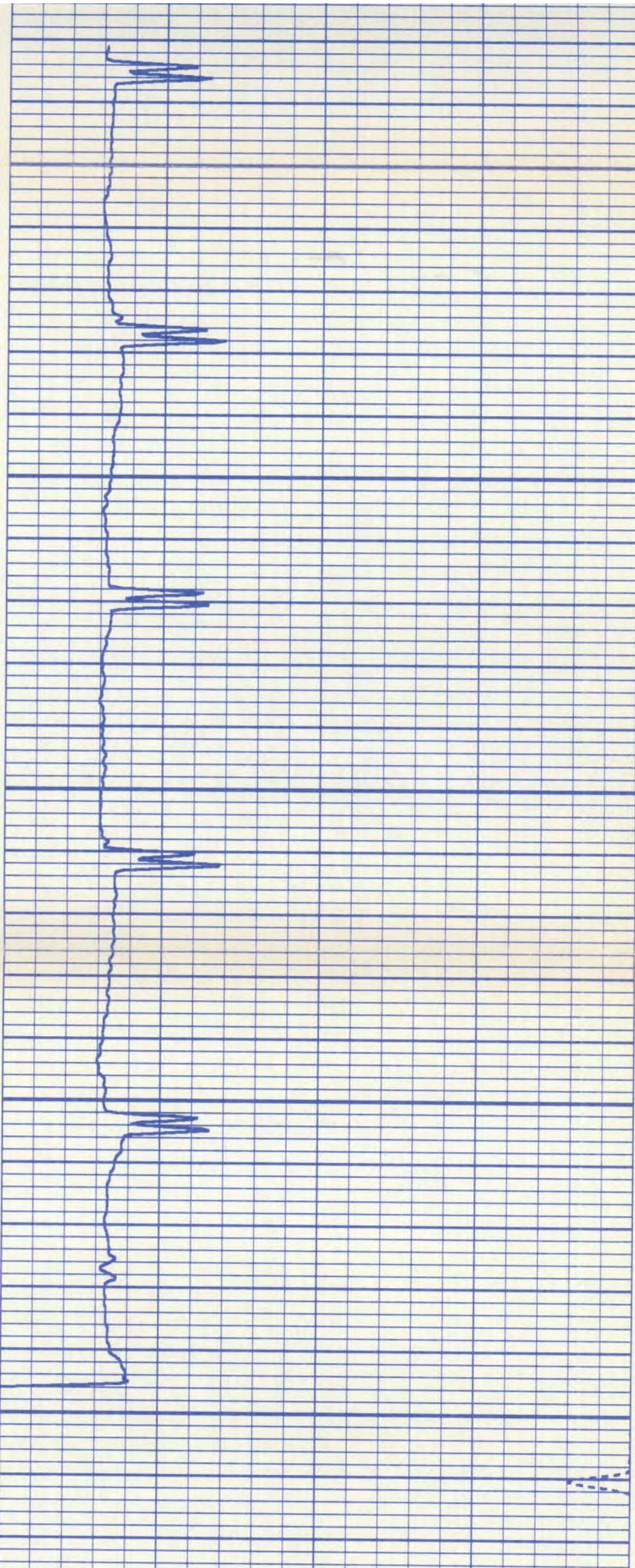




03100

03200

03300



TEN (LBS)

1000

0

AID

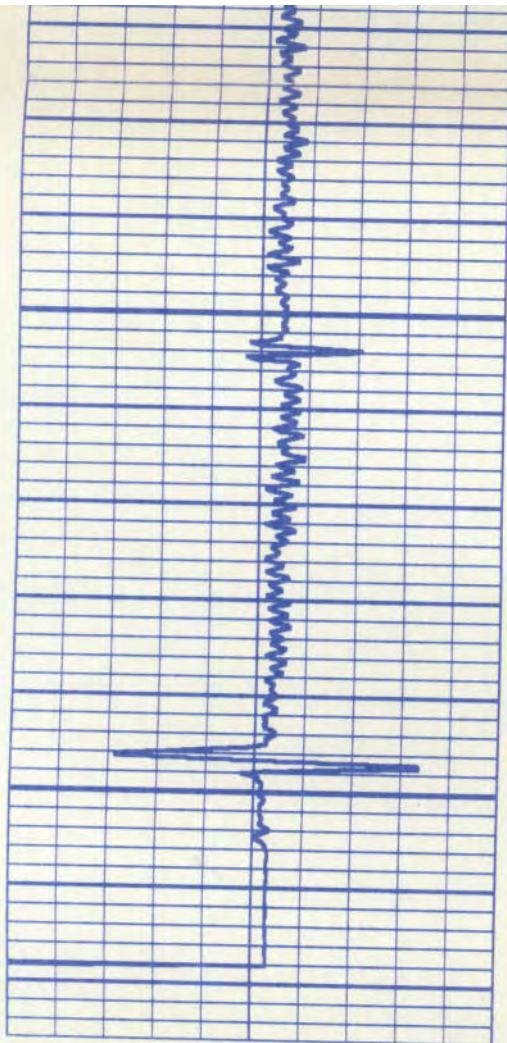
-100

100

120

300

PHAS (DEG)



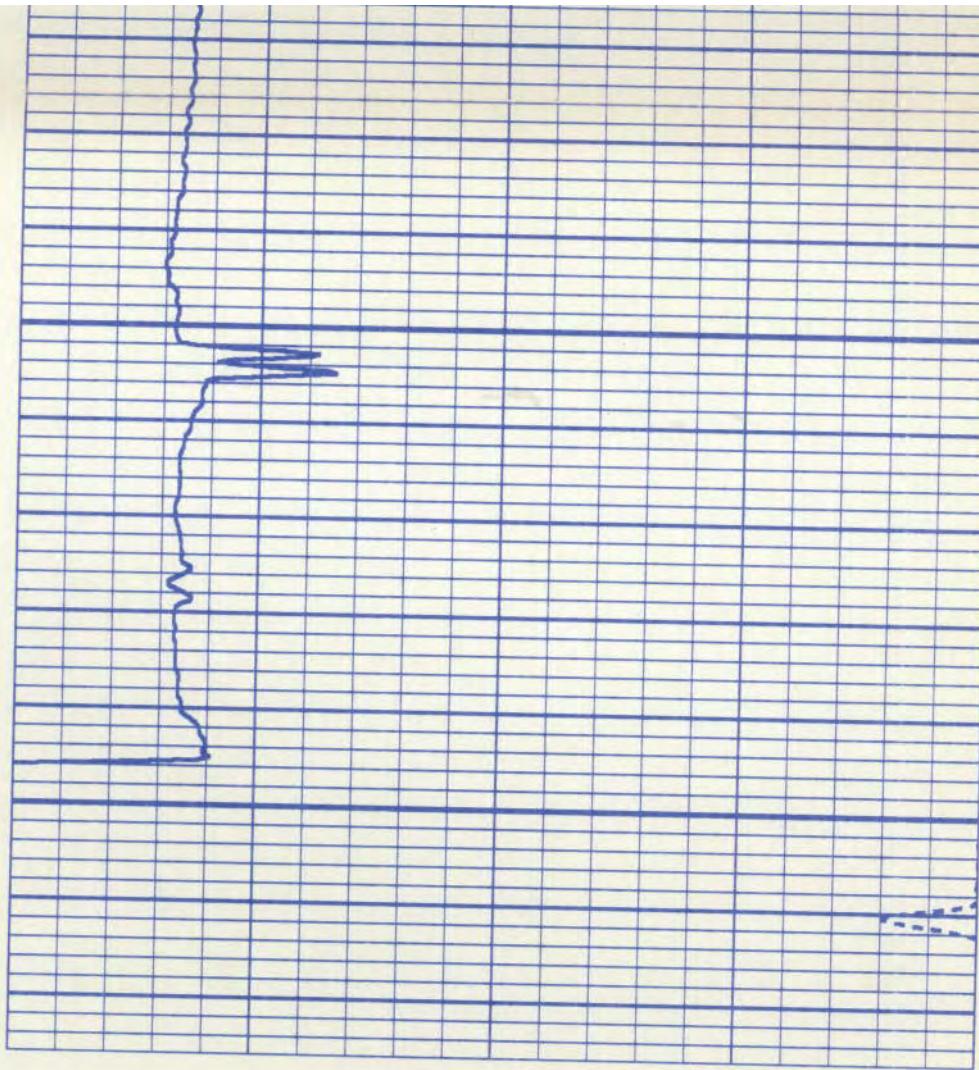
AID

-100

100

120

03300



TEN (LBS)

1000

0

PHAS (DEG)

300

FILE: 2

ECO Solutions, Inc.

Environmental Engineering and Technical Services

**APPENDIX C - ANNULUS PRESSURE
TEST**

14219

LEVEL	225
ANH PRS	925
DIF PRS	725
H	625
IHJ PRS	315
250mash	135
Mar. 11 10:00_	75
0	0
P	0
PRS	0

HOECHST CELANESE OILS

500.0 1000.0 0
300.0 600.0 0

卷之三

10

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Mar 11 1940	03:57	DIF F ₂₀	MARSHAL H	315.40 ₁	AMM50E3	1960.00±10	79.51	89.17±10	90	100
11H PRS	-3.7F549									

100% 50-60 200% 0-100 LEVEL

卷之三

LEADER

LEVEL	TIME	INJ PRRS	SHR PRRS	INJ PRRS	SHR PRRS
1	44.9 + 4	3	6	3	6
2	50.0 + 4	4	5	4	5
3	54.0 + 4	5	6	5	6
4	58.0 + 4	6	7	6	7
5	62.0 + 4	7	8	7	8
6	66.0 + 4	8	9	8	9
7	70.0 + 4	9	10	9	10
8	74.0 + 4	10	11	10	11
9	78.0 + 4	11	12	11	12
10	82.0 + 4	12	13	12	13
11	86.0 + 4	13	14	13	14
12	90.0 + 4	14	15	14	15
13	94.0 + 4	15	16	15	16
14	98.0 + 4	16	17	16	17
15	102.0 + 4	17	18	17	18
16	106.0 + 4	18	19	18	19
17	110.0 + 4	19	20	19	20
18	114.0 + 4	20	21	20	21
19	118.0 + 4	21	22	21	22
20	122.0 + 4	22	23	22	23
21	126.0 + 4	23	24	23	24
22	130.0 + 4	24	25	24	25
23	134.0 + 4	25	26	25	26
24	138.0 + 4	26	27	26	27
25	142.0 + 4	27	28	27	28
26	146.0 + 4	28	29	28	29
27	150.0 + 4	29	30	29	30
28	154.0 + 4	30	31	30	31
29	158.0 + 4	31	32	31	32
30	162.0 + 4	32	33	32	33
31	166.0 + 4	33	34	33	34
32	170.0 + 4	34	35	34	35
33	174.0 + 4	35	36	35	36
34	178.0 + 4	36	37	36	37
35	182.0 + 4	37	38	37	38
36	186.0 + 4	38	39	38	39
37	190.0 + 4	39	40	39	40
38	194.0 + 4	40	41	40	41
39	198.0 + 4	41	42	41	42
40	202.0 + 4	42	43	42	43
41	206.0 + 4	43	44	43	44
42	210.0 + 4	44	45	44	45
43	214.0 + 4	45	46	45	46
44	218.0 + 4	46	47	46	47
45	222.0 + 4	47	48	47	48
46	226.0 + 4	48	49	48	49
47	230.0 + 4	49	50	49	50
48	234.0 + 4	50	51	50	51
49	238.0 + 4	51	52	51	52
50	242.0 + 4	52	53	52	53
51	246.0 + 4	53	54	53	54
52	250.0 + 4	54	55	54	55
53	254.0 + 4	55	56	55	56
54	258.0 + 4	56	57	56	57
55	262.0 + 4	57	58	57	58
56	266.0 + 4	58	59	58	59
57	270.0 + 4	59	60	59	60
58	274.0 + 4	60	61	60	61
59	278.0 + 4	61	62	61	62
60	282.0 + 4	62	63	62	63
61	286.0 + 4	63	64	63	64
62	290.0 + 4	64	65	64	65
63	294.0 + 4	65	66	65	66
64	298.0 + 4	66	67	66	67
65	302.0 + 4	67	68	67	68
66	306.0 + 4	68	69	68	69
67	310.0 + 4	69	70	69	70
68	314.0 + 4	70	71	70	71
69	318.0 + 4	71	72	71	72
70	322.0 + 4	72	73	72	73
71	326.0 + 4	73	74	73	74
72	330.0 + 4	74	75	74	75
73	334.0 + 4	75	76	75	76
74	338.0 + 4	76	77	76	77
75	342.0 + 4	77	78	77	78
76	346.0 + 4	78	79	78	79
77	350.0 + 4	79	80	79	80
78	354.0 + 4	80	81	80	81
79	358.0 + 4	81	82	81	82
80	362.0 + 4	82	83	82	83
81	366.0 + 4	83	84	83	84
82	370.0 + 4	84	85	84	85
83	374.0 + 4	85	86	85	86
84	378.0 + 4	86	87	86	87
85	382.0 + 4	87	88	87	88
86	386.0 + 4	88	89	88	89
87	390.0 + 4	89	90	89	90
88	394.0 + 4	90	91	90	91
89	398.0 + 4	91	92	91	92
90	402.0 + 4	92	93	92	93
91	406.0 + 4	93	94	93	94
92	410.0 + 4	94	95	94	95
93	414.0 + 4	95	96	95	96
94	418.0 + 4	96	97	96	97
95	422.0 + 4	97	98	97	98
96	426.0 + 4	98	99	98	99
97	430.0 + 4	99	100	99	100
98	434.0 + 4	100	101	100	101
99	438.0 + 4	101	102	101	102
100	442.0 + 4	102	103	102	103
101	446.0 + 4	103	104	103	104
102	450.0 + 4	104	105	104	105
103	454.0 + 4	105	106	105	106
104	458.0 + 4	106	107	106	107
105	462.0 + 4	107	108	107	108
106	466.0 + 4	108	109	108	109
107	470.0 + 4	109	110	109	110
108	474.0 + 4	110	111	110	111
109	478.0 + 4	111	112	111	112
110	482.0 + 4	112	113	112	113
111	486.0 + 4	113	114	113	114
112	490.0 + 4	114	115	114	115
113	494.0 + 4	115	116	115	116
114	498.0 + 4	116	117	116	117
115	502.0 + 4	117	118	117	118
116	506.0 + 4	118	119	118	119
117	510.0 + 4	119	120	119	120
118	514.0 + 4	120	121	120	121
119	518.0 + 4	121	122	121	122
120	522.0 + 4	122	123	122	123
121	526.0 + 4	123	124	123	124
122	530.0 + 4	124	125	124	125
123	534.0 + 4	125	126	125	126
124	538.0 + 4	126	127	126	127
125	542.0 + 4	127	128	127	128
126	546.0 + 4	128	129	128	129
127	550.0 + 4	129	130	129	130
128	554.0 + 4	130	131	130	131
129	558.0 + 4	131	132	131	132
130	562.0 + 4	132	133	132	133
131	566.0 + 4	133	134	133	134
132	570.0 + 4	134	135	134	135
133	574.0 + 4	135	136	135	136
134	578.0 + 4	136	137	136	137
135	582.0 + 4	137	138	137	138
136	586.0 + 4	138	139	138	139
137	590.0 + 4	139	140	139	140
138	594.0 + 4	140	141	140	141
139	598.0 + 4	141	142	141	142
140	602.0 + 4	142	143	142	143
141	606.0 + 4	143	144	143	144
142	610.0 + 4	144	145	144	145
143	614.0 + 4	145	146	145	146
144	618.0 + 4	146	147	146	147
145	622.0 + 4	147	148	147	148
146	626.0 + 4	148	149	148	149
147	630.0 + 4	149	150	149	150
148	634.0 + 4	150	151	150	151
149	638.0 + 4	151	152	151	152
150	642.0 + 4	152	153	152	153
151	646.0 + 4	153	154	153	154
152	650.0 + 4	154	155	154	155
153	654.0 + 4	155	156	155	156
154	658.0 + 4	156	157	156	157
155	662.0 + 4	157	158	157	158
156	666.0 + 4	158	159	158	159
157	670.0 + 4	159	160	159	160
158	674.0 + 4	160	161	160	161
159	678.0 + 4	161	162	161	162
160	682.0 + 4	162	163	162	163
161	686.0 + 4	163	164	163	164
162	690.0 + 4	164	165	164	165
163	694.0 + 4	165	166	165	166
164	698.0 + 4	166	167	166	167
165	702.0 + 4	167	168	167	168
166	706.0 + 4	168	169	168	169
167	710.0 + 4	169	170	169	170
168	714.0 + 4	170	171	170	171
169	718.0 + 4	171	172	171	172
170	722.0 + 4	172	173	172	173
171	726.0 + 4	173	174	173	174
172	730.0 + 4	174	175	174	175
173	734.0 + 4	175	176	175	176
174	738.0 + 4	176	177	176	177
175	742.0 + 4	177	178	177	178
176	746.0 + 4	178	179	178	179
177	750.0 + 4	179	180	179	180
178	754.0 + 4	180	181	180	181
179	758.0 + 4	181	182	181	182
180	762.0 + 4	182	183	182	183
181	766.0 + 4	183	184	183	184
182	770.0 + 4	184	185	184	185
183	774.0 + 4	185	186	185	186
184	778.0 + 4	186	187	186	187
185	782.0 + 4	187	188	187	188
186	786.0 + 4	188	189	188	189
187	790.0 + 4	189	190	189	190
188	794.0 + 4	190	191	190	191
189	798.0 + 4	191	192	191	192
190	802.0 + 4	192	193	192	193
191	806.0 + 4	193	194	193	194
192	810.0 + 4	194	195	194	195
193	814.0 + 4	195	196	195	196
194	818.0 + 4	196	197	196	197
195	822.0 + 4	197	198	197	198
196	826.0 + 4	198	199	198	199
197	830.0 + 4	199	200	199	200
198	834.0 + 4	200	201	200	201
199	838.0 + 4	201	202	201	202
200	842.0 + 4	202	203	202	203
201	846.0 + 4	203	204	203	204
202	850.0 + 4	204	205	204	205
203	854.0 + 4	205	206	205	206
204	858.0 + 4	206	207	206	207
205	862.0 + 4	207	208	207	208
206	866.0 + 4	208	209	208	209
207	870.0 + 4	209	210	209	210
208	874.0 + 4	210	211	210	211
209	878.0 + 4	211	212	211	212
210	882.0 + 4	212	213	212	213
211	886.0 + 4	213	214	213	214
212	890.0 + 4	214	215	214	215
213	894.0 + 4	215	216	215	216
214	898.0 + 4	216	217	216	217
215	902.0 + 4	217	218	217	218
216	906.0 + 4	218	219	218	219
217	910.0 + 4	219	220	219	220
218	914.0 + 4	220	221	220	221
219	918.0 + 4	221	222	221	222
220	922.0 + 4	222	223	222	223
221	926.0 + 4	223	224	223</td	

100% Sod. BHT
50% Sod. BHT
10% Sod. BHT
5% Sod. BHT

YOKOGAWA ◆

KOKUSAI CHART

CHART NO. B9627RY

ECO Solutions, Inc.

Environmental Engineering and Technical Services

**APPENDIX D - RADIOACTIVE
TRACER SURVEY ON WDW-49 (WELL
NO. 4)
WITH WESTERN ATLAS
INTERPRETATION LETTER**

DIAGNOSTIC RADIOACTIVE TRACERLOG

**Hoechst Celanese Chemical Group, Inc.
Well #4
Bay City Plant
Matagorda County, Texas**

**Prepared for
ECO Solutions, Inc.
Houston, Texas**

**ATLAS WIRELINE SERVICES
WESTERN ATLAS INTERNATIONAL**

March 11, 1994

Prepared by Freeman Hill, III

DISCLAIMER

In making interpretations of logs, our employees will give Customer the benefit of their best judgement, but since all interpretations are opinions based on inferences from electrical or other measurements, we cannot, and we do not guarantee the accuracy or the correctness of any interpretation. We shall not be liable or responsible for any loss, cost, damages, or expenses whatsoever incurred or sustained by the Customer resulting from any interpretation made/by any of our employees.



ATLAS WIRELINE SERVICES

Disposal Well Background

The Hoechst Celanese Chemical Group, Inc.'s Injection Well #4, located at the Bay City facility has been used for underground injection. In addition to surface casing string, the well contains a string of 7-5/8 inch OD casing cemented to 3368 ft and 5.5 inch tubing and packer assembly, located at 3316 ft. and 4.5 screen from 3371 ft to 3579 ft.

A logging program consisting of a Radioactive Tracer ejector and detector instrument was used to evaluate the integrity of the casing and cement and to verify that the injection interval had accepted the disposed fluids.

Radioactive Tracerlog Survey

1. Logged API gamma ray from well depth of 3136 ft to 3428 ft.

Purpose: Base-line for radioactive tracer instrument and post survey.

Analysis: Gamma ray instruments respond to naturally occurring radiation (e.g., potassium, uranium, thorium) found in formations. Normally, shaly formations tend to contain more of these gamma ray-producing elements than a sand formation.

2. Logged gamma ray detectors off Radioactive Tracerlog from well depth of 3000 ft. to 3433 ft.

Purpose: A base-line for radioactive tracer instrument.

Analysis: Baseline check - good. There were not any anomalies.

3. Repeat Step 2.

Analysis: No anomalies noted.

4. While injecting into the well at 10 gpm, radioactive material (Iodine -131) was ejected from radioactive tracer instrument at 3000 ft. The instrument was lowered further into the well and then logged in the upward direction in order to intercept and detect the radioactive slug as it moved down the well. By repeating this process of lowering the instrument and logging in the upward direction, the radioactive slug was traced through the casing packer and into the injection interval located below.

Purpose: Ensure injected fluids move through the tubing in a downward direction and that no upward or out of zone fluid movement through a cement channel is detected.

Logging Program and Analysis (Cont.)
Hoecsh Celanese Chemical Group, Inc. Well #4
Page 2

Analysis: The following table depicts the depths where the detector intercepted the radioactive slug as it moved with the surface-injected fluids downward toward the injection interval.

File	Interception
#	Depth ft. (Bottom Detector)
8	3050
9	3129
10	3232
11	3333
12	3432 Tail End
13	---- Tail End
14	Just about gone - No trace of radioactive material above.

The radioactive peak responses from the first pass, file # 8, to file # 14 the last pass, become smaller, but cover a longer vertical interval, due to the movement of the wireline and instrument mixing the radioactive slug with the injected fluids. The radioactive material appears to continually move in the downward direction and into the disposal interval. There is no evidence of any problems.

5. Repeat step 4 (Chase Survey). (Pump Rate = 10 GPM)

Purpose: Ensure injected fluids move through the tubing in a downward direction and that no channel activity (fluid movement) to other zones above the target interval is detected.

Analysis: The following table depicts the depths where the detector intercepted the second radioactive slug (ejected at 4681 ft) as it moved with the injected fluids downward toward the injection interval.

File	Interception
#	Depth ft. (Bottom Detector)
15	3060
16	3135
17	3219
18	3317
19	3418
20	---- Tail End
21	Just about gone - No trace of radioactive material above.

Logging Program and Analysis (Cont.)
Hoecsh Celanese Chemical Group, Inc. Well #4
Page 3

Again, the radioactive peak responses on the log become smaller (and wider) during the survey due to the mixing action of the wireline and instrument. The radioactive slug appeared to continuously move down to the disposal area. There is no evidence of any problems.

6. The tool was stationed at 3348 ft, above the disposal interval, for a stationary reading. The radioactive isotope is released and after the initial response to the isotope passing by the detector in a downward motion, then the isotope or an increase in radiation, should not be monitored again. If the isotope is seen again, then communication (channel behind pipe) is highly possible.

Purpose: Ensure injected fluids move downward and not back up on the outside of casing in a channel, (Initial Pump Rate - 10 GPM; then increased to 120 GPM) (15-minute test).

Analysis: After the initial response to the radioactive slug, the isotope slug did not come back into the tools' vicinity. No channel indicated.

An incremental change in radiation was observed on the bottom detector only. This corresponds to the pump rate increase from 10 GPM to 100 GPM. The tool had to be pressure stabilized; during this event, some material leaked out of the ejector cylinder.

7. Repeat step 6 (Stationary Reading). (Pump Rate - 120 GPM) (15-minute test).

Purpose: Ensure injected fluids are not channeling up.

Analysis: After the initial response to the radioactive slug, the isotope did not come back in the tools' vicinity. No channel indicated.

8. Repeat Step 7 (Stationary Pending) (Pump Rate - 120 GPM) (15-minute test).

Purpose: Ensure injected fluids are not channeling up.

Analysis: After the initial response to the radioactive slug, the isotope did not come back in the tool's vicinity. No channel indicated.

9. Logged gamma detectors from well depth 2906 ft. to 3426 ft.

Purpose: Monitor any anomalies or change in background baseline.

Analysis: No significant anomalies found on both detectors.

Logging Program and Analysis (Cont.)
Hoecsht Celanese Chemical Group, Inc. Well #4
Page 4

Conclusion:

In my opinion, the Hoecsht Celanese Well #4, located in the Bay City Plant, does not have any integrity problems that would result in disposed fluids migrating to intervals other than the injection zone. The logging program consisting of a radioactive tracer ejector and detector instrument should satisfy the annual mechanical integrity requirement.



**ATLAS
WIRELINE
SERVICES**

NUCLEAR TRACER LOG

FILE NO.
94062
API NO.

COMPANY
HOECHST CELANESE CORP.
WELL
WELL NO. 4

FIELD
BAY CITY

COUNTY
MATAGORDA
STATE
TEXAS

LOCATION:
NA.
SEC NA. TWP NA. RGE NA.
OTHER SERVICES
GAMMA RAY

PERMANENT DATUM
LOGGING MEASURED FROM
DRILLING MEASURED FROM

GROUND LEVEL
KB. 12 FT. ABOVE P.D.
KB

ELEV. NA.
KB NA.
DF NA.
GL NA.

FINAL PRINT

IN MAKING INTERPRETATIONS OF LOGS OUR
EMPLOYEES WILL GIVE CUSTOMER THE BENE-
FIT OF THEIR BEST JUDGEMENT, BUT SINCE
ALL INTERPRETATIONS ARE OPINIONS BASED
ON INFERENCES FROM ELECTRICAL OR OTHER
MEASUREMENTS, WE CANNOT, AND WE DO NOT
GUARANTEE THE ACCURACY OR CORRECTNESS
OF ANY INTERPRETATION. WE SHALL NOT BE
LIABLE OR RESPONSIBLE FOR ANY LOSS,
COST, DAMAGES, OR EXPENSES WHATSOEVER
INCURRED OR SUSTAINED BY THE CUSTOMER
RESULTING FROM ANY INTERPRETATION MADE
BY ANY OF OUR EMPLOYEES.

FOLD HERE

CASING RECORD

REMARKS RUN (1)

LOG CORRELATED TO IEL 5-14-6^a. FIRST SLUG WAS SHOT AT 3000', PUMP RATE WAS 10 GPM. SEVEN PASSES WERE MADE. R/A MATERIAL TRAVELED DOWN HOLE. SECOND SLUG WAS SHOT AT 3000', PUMP RATE WAS 10 GPM. SEVEN PASSES WERE MADE. R/A MATERIAL TRAVELED DOWN HOLE. TWO STATIONARY SLUGS WERE SHOT AT 3348, PUMP RATE CHANGE. NOTE BOTTOM DET. 10 120 GPM. EJECTOR LEAKED ON PUMP RATE CHANGE. NO CHANNEL DETECTED. THIRD STATIONARY SLUG WAS SHOT AT 3350, NO CHANNEL DETECTED. ALL STATIONARY RUNS WERE RECORDED AT 15 MIN. EACH.

EQUIPMENT DATA

RUN	TRIP	TOOL	SERIAL NO.	SERIES NO.	POSITION
1	1	CCL	*		

WELL DATA

WDW WELL NO. 4
PACKER 3316 - 3322
SCREEN 3371 - 3579
PBTD 3433

BACKGROUND GAMMA RAY PASS NO. 2

FILE: 3

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
TDET	3,6	FT,IN
BDET	0	FT,IN
CCL	17,0	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORP.

RUN: 1

WELL NAME: WELL NO.4

TRIP: 1

SERVICE: F 150A FILE: 3

DATE: 03/11/94

TIME: 12:12:28

REVISION: FSYS256 REV:Q002 VER:2.0

MODE: RECORD

CCL
0100

TEN (LBS)
5000 0

TDET (CPS)

0 500

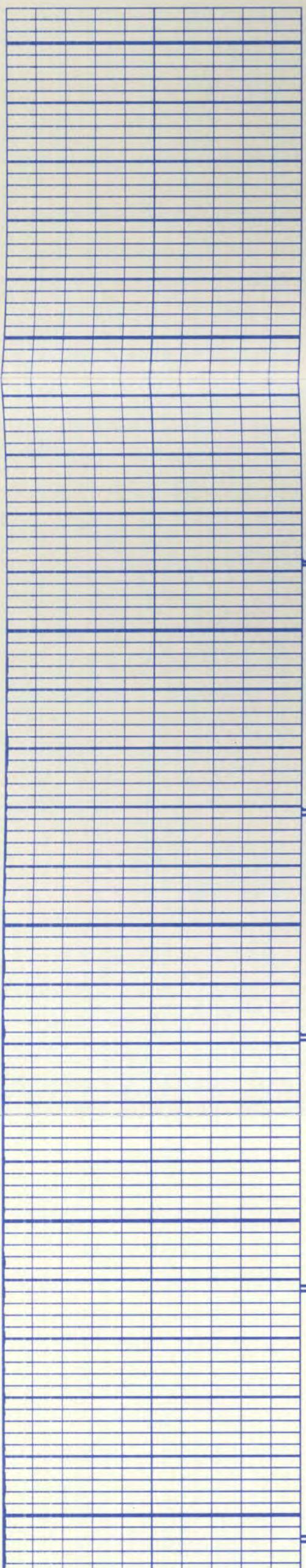
0290

BDET (CPS)

0 500

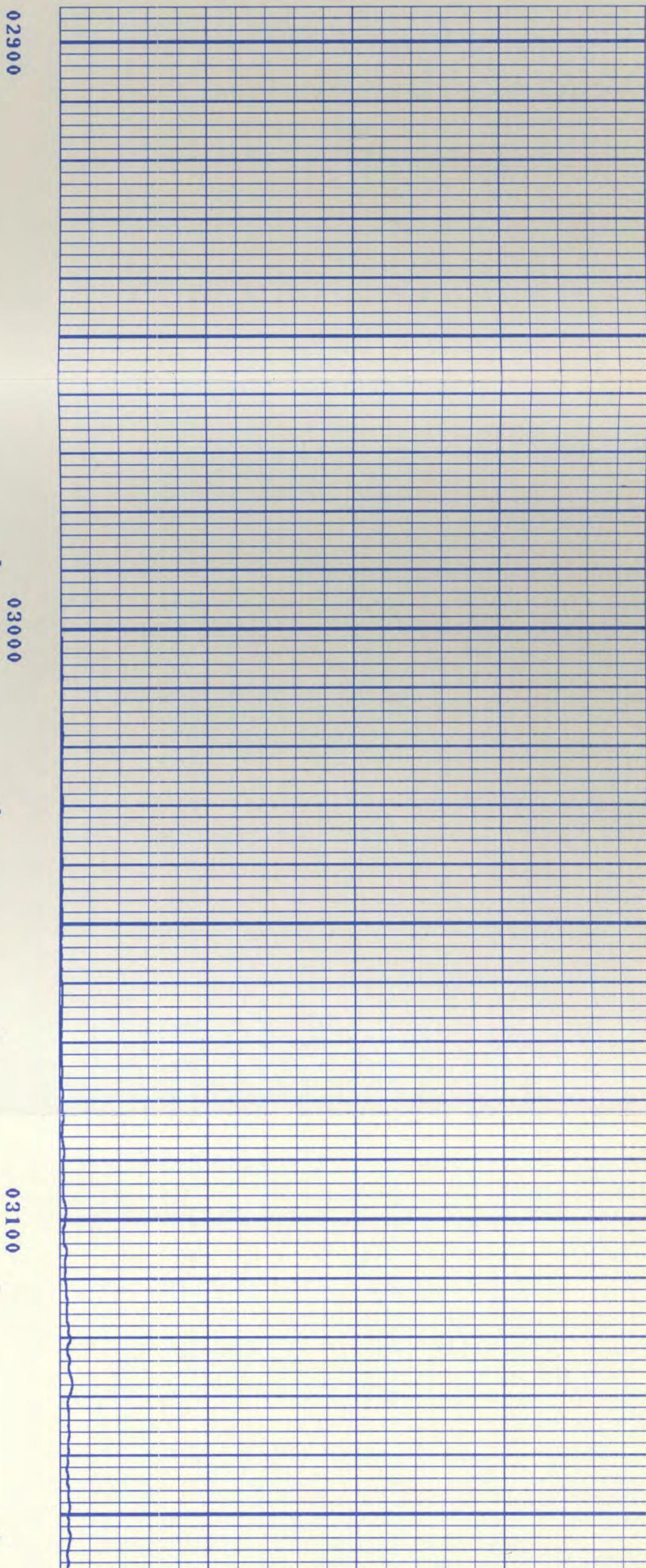
TDET (CPS)

0 500



BDET (CPS)

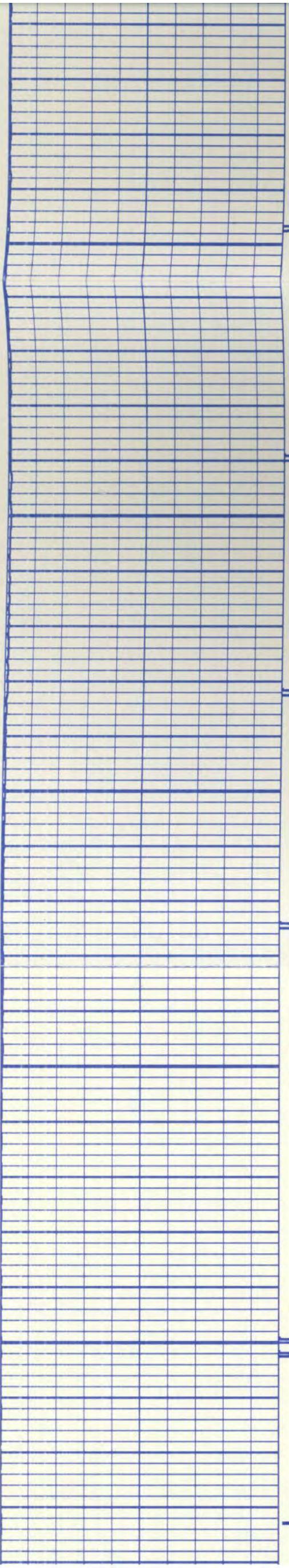
0 500



02900

03000

03100

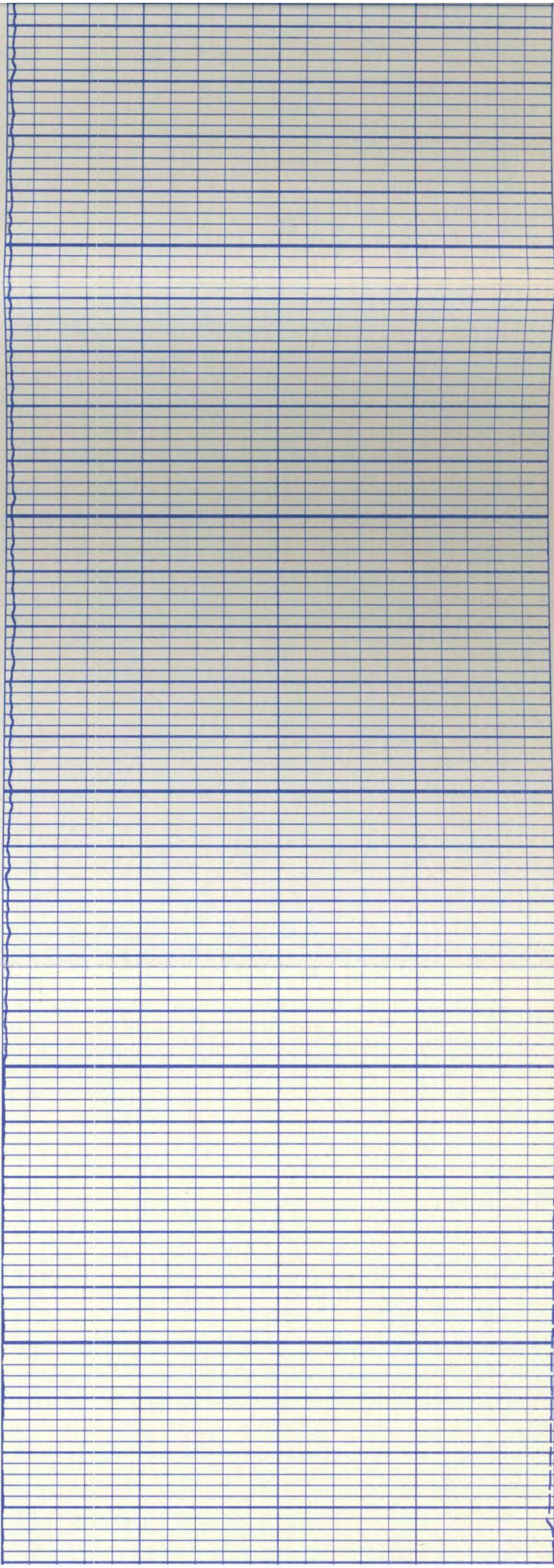


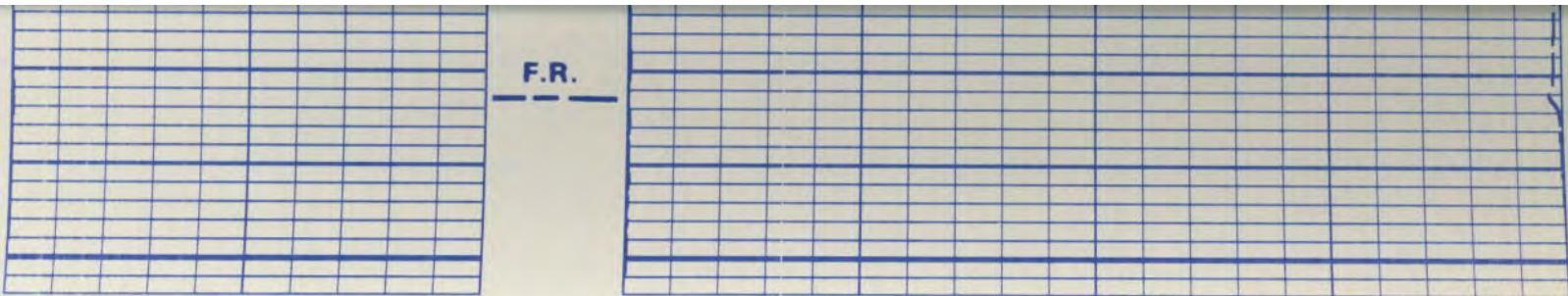
03200

03300

03400

F.R.





0100

TEN (LBS)

5000

0

TDET (CPS)

0 500

BDET (CPS)

0 500

FILE: 3

BACKGROUND GAMMA RAY PASS NO. 1

FILE: 2

CURVE DELAY REPORT

CURVE	PHYS.	UNITS
-----	-----	-----
TDET	3,6	FT,IN
BDET	0	FT,IN
CCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORP.

RUN: 1

WELL NAME: WELL NO.4

TRIP: 1

SERVICE: F 150A FILE: 2

DATE: 03/11/94

TIME: 11:52:38

REVISION: FSYS256 REV:G002 VER:2.0

MODE: RECORD

0100

TEN (LBS)

5000

0

TDET (CPS)

0 500

BDET (CPS)

0 500

029

CCL
0100

TEN (LBS)

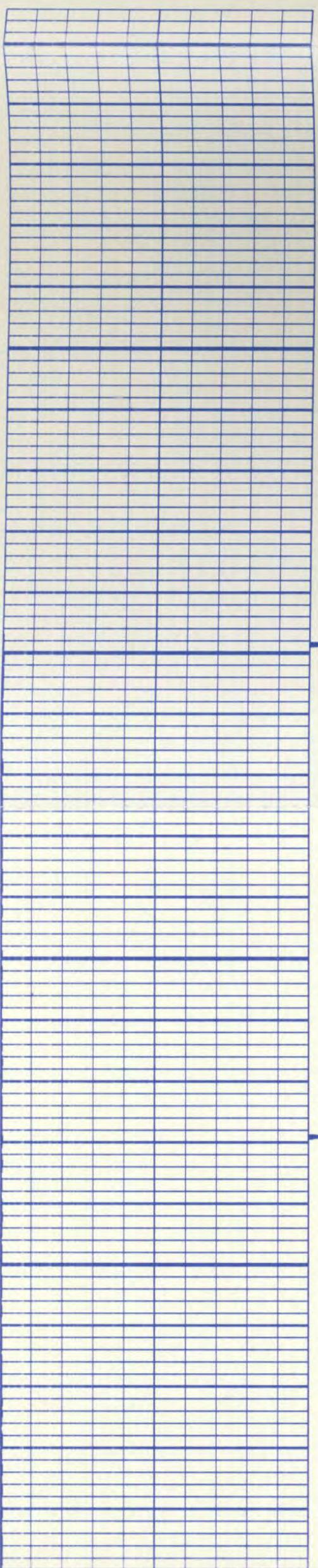
5000

TDET (CPS)

0 500

BDET (CPS)

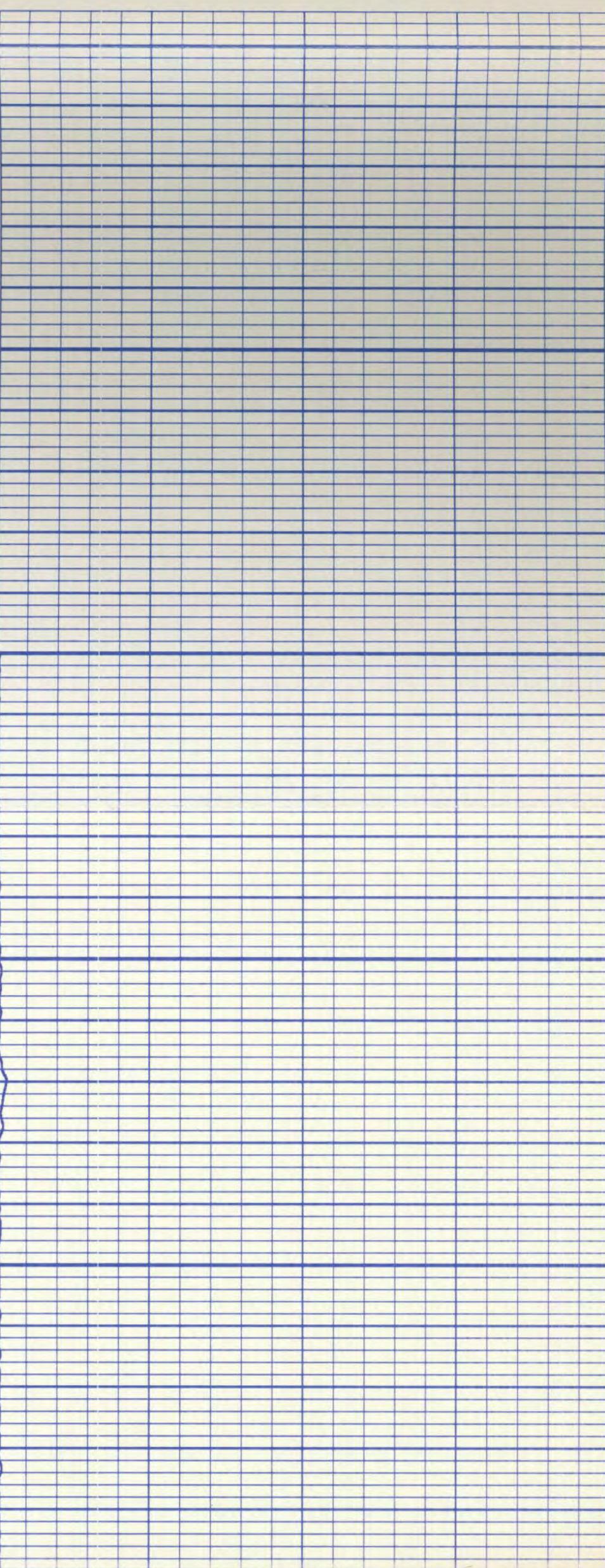
0 500



02900

03000

03100



03200

03300

03.

03400

F.R.

CCL
0100

TDET (CPS)

0 500

TEN (LBS)

5000 0

BDET (CPS)

500

FILE: 2

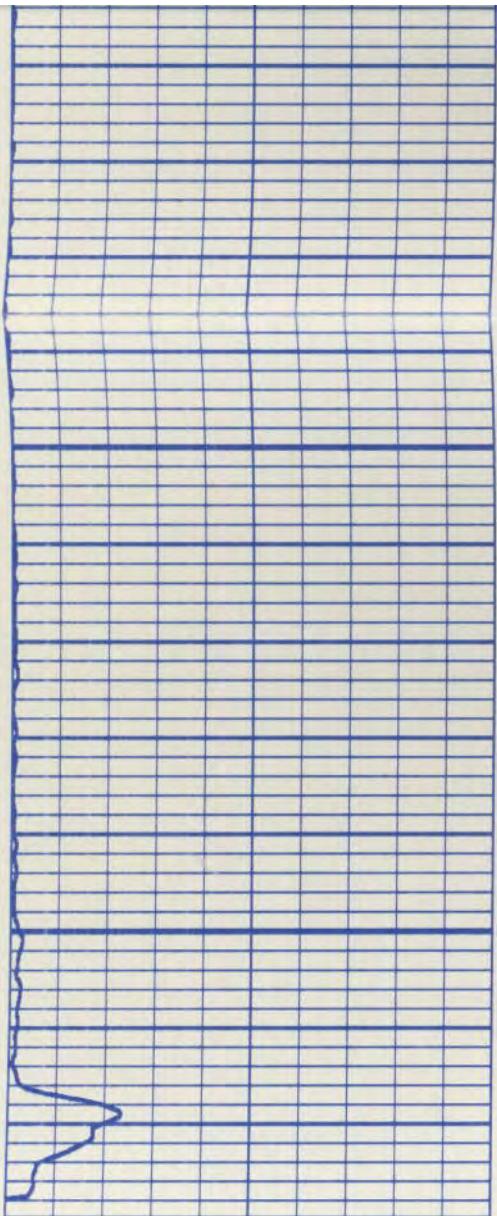
FIRST SLUG SHOT AT 3000'
INJECTION RATE WAS 10 G.P.M.
SEVEN PASSES WERE MADE NO CHANNEL
WAS DETECTED.
FILES: 8-14

0

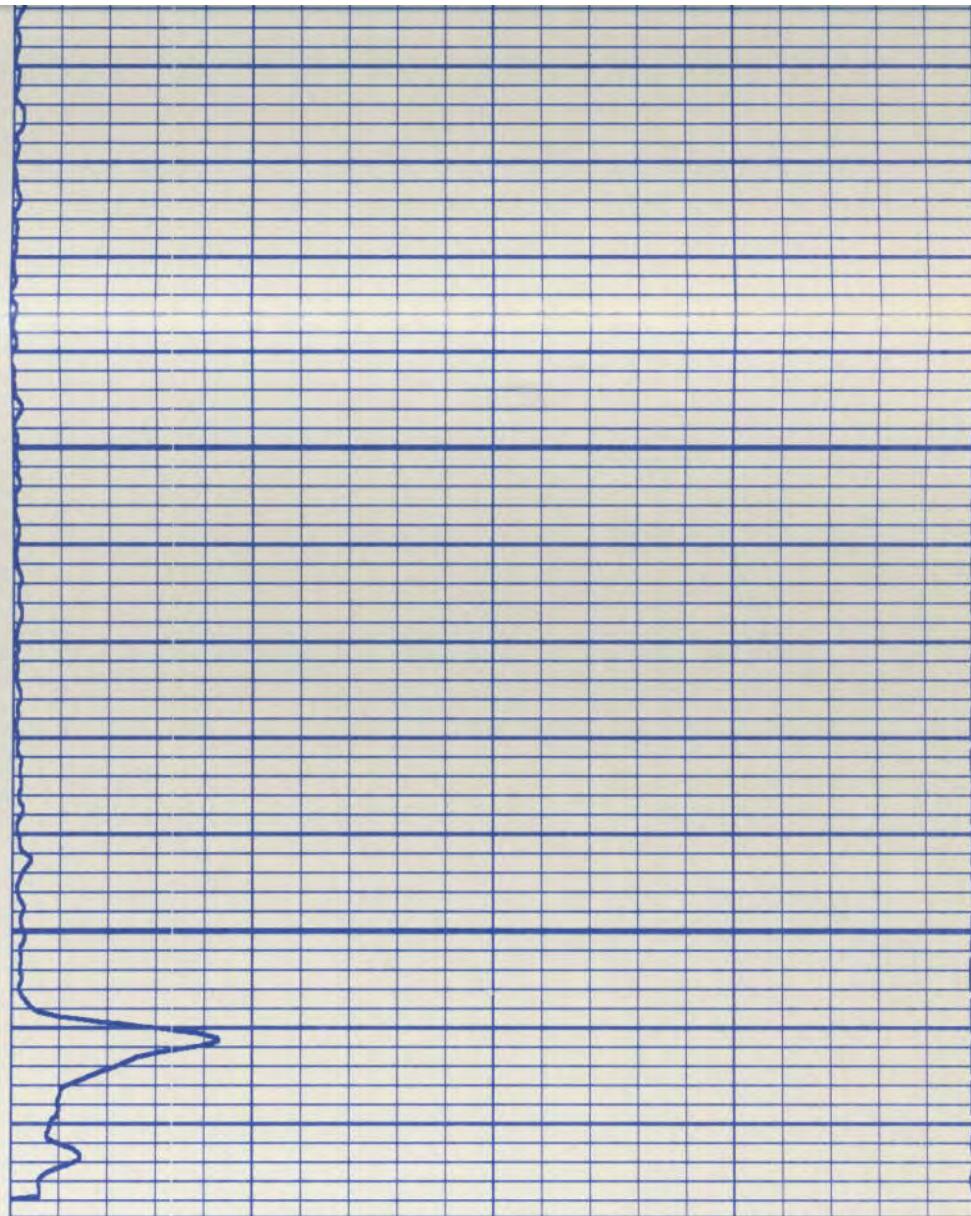
03100

03200

03300



03400

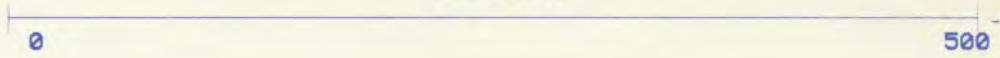


TEN (LBS)

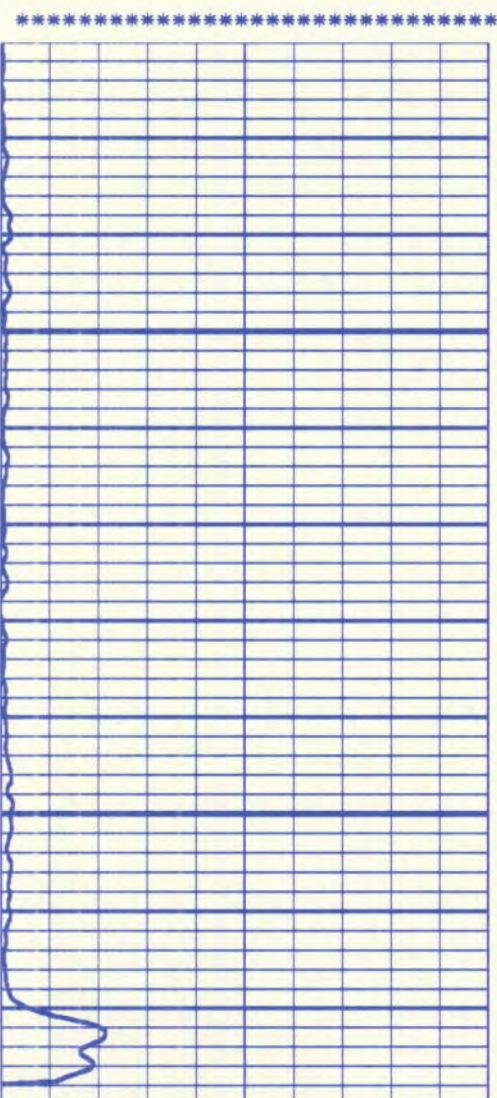
5000

0

BDET (CPS)

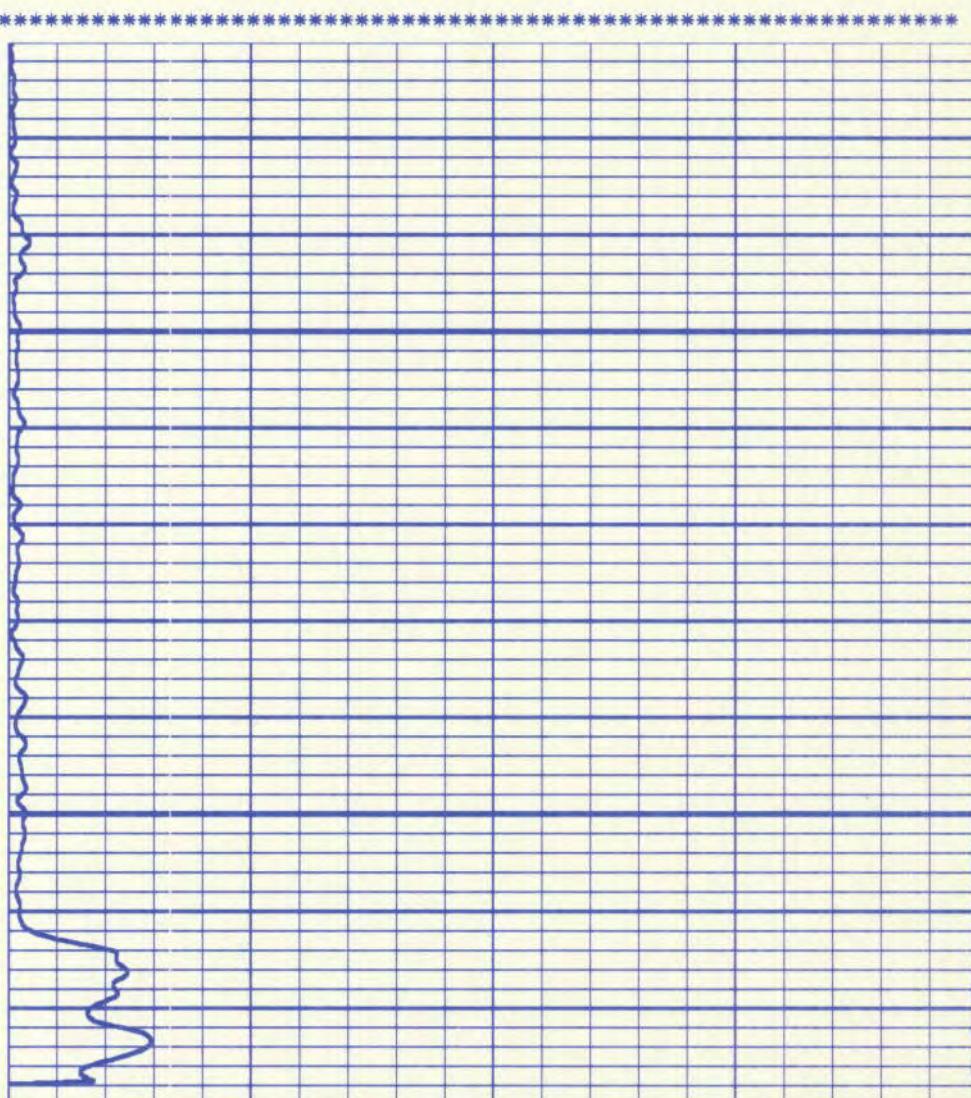


FILE: 14

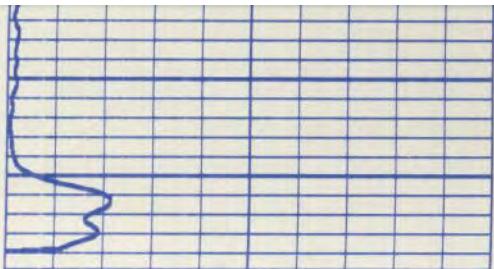


03400

CCL



TEN (LBS)



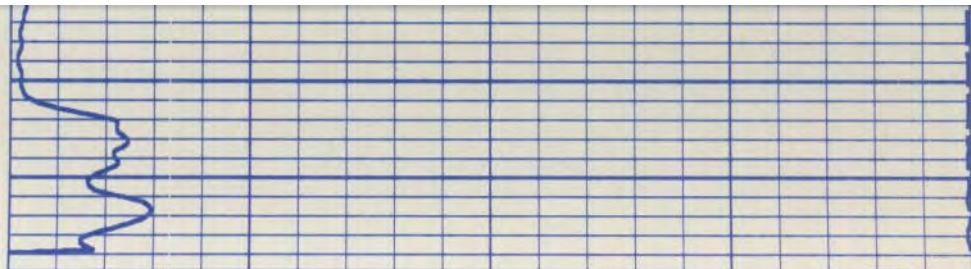
10

CCL

0100

TDET (CPS)

0 500



TEN (LBS)

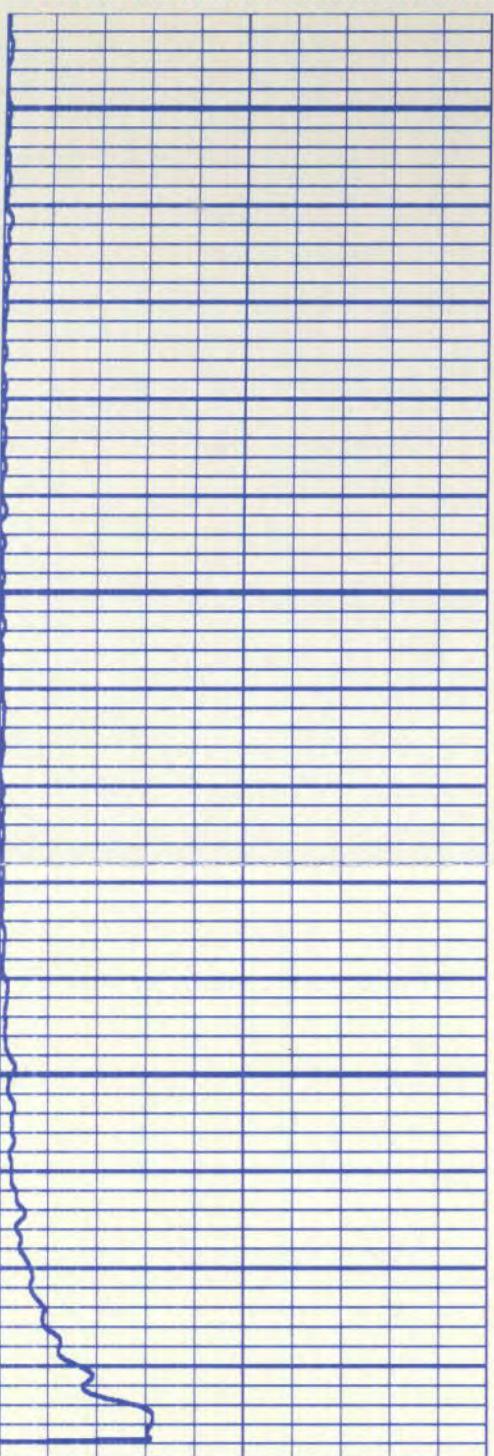
5000

0

BDET (CPS)

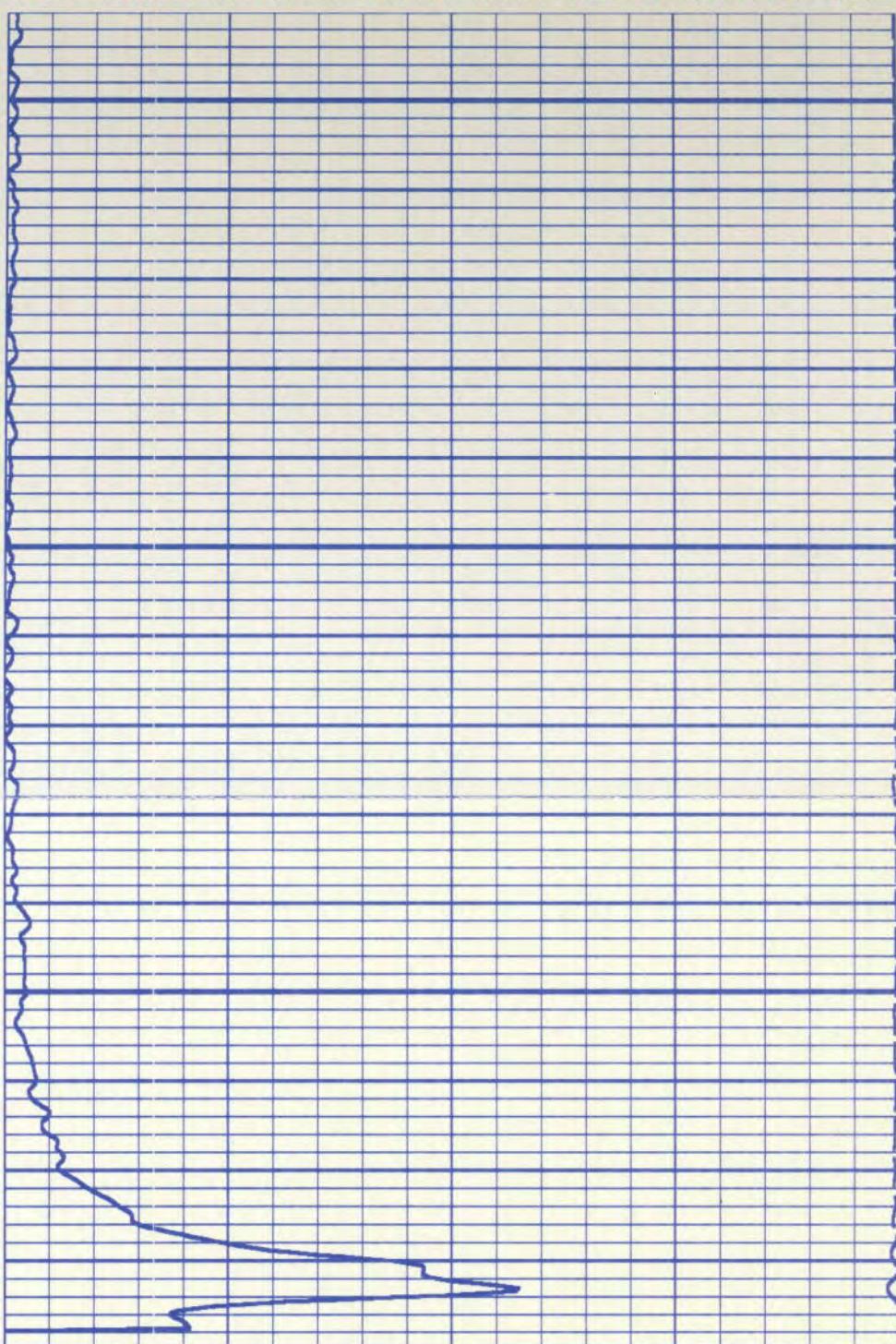
0 500

FILE: 13



03300

03400



TEN (LBS)

5000

0

CCL

0100

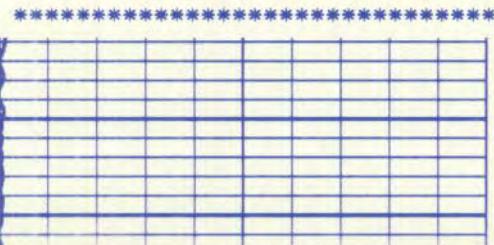
TDET (CPS)

0 500

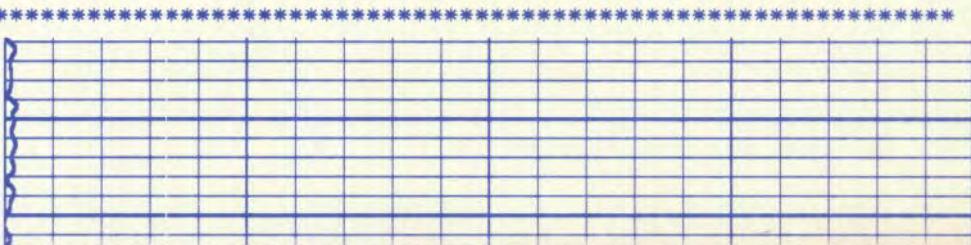
BDET (CPS)

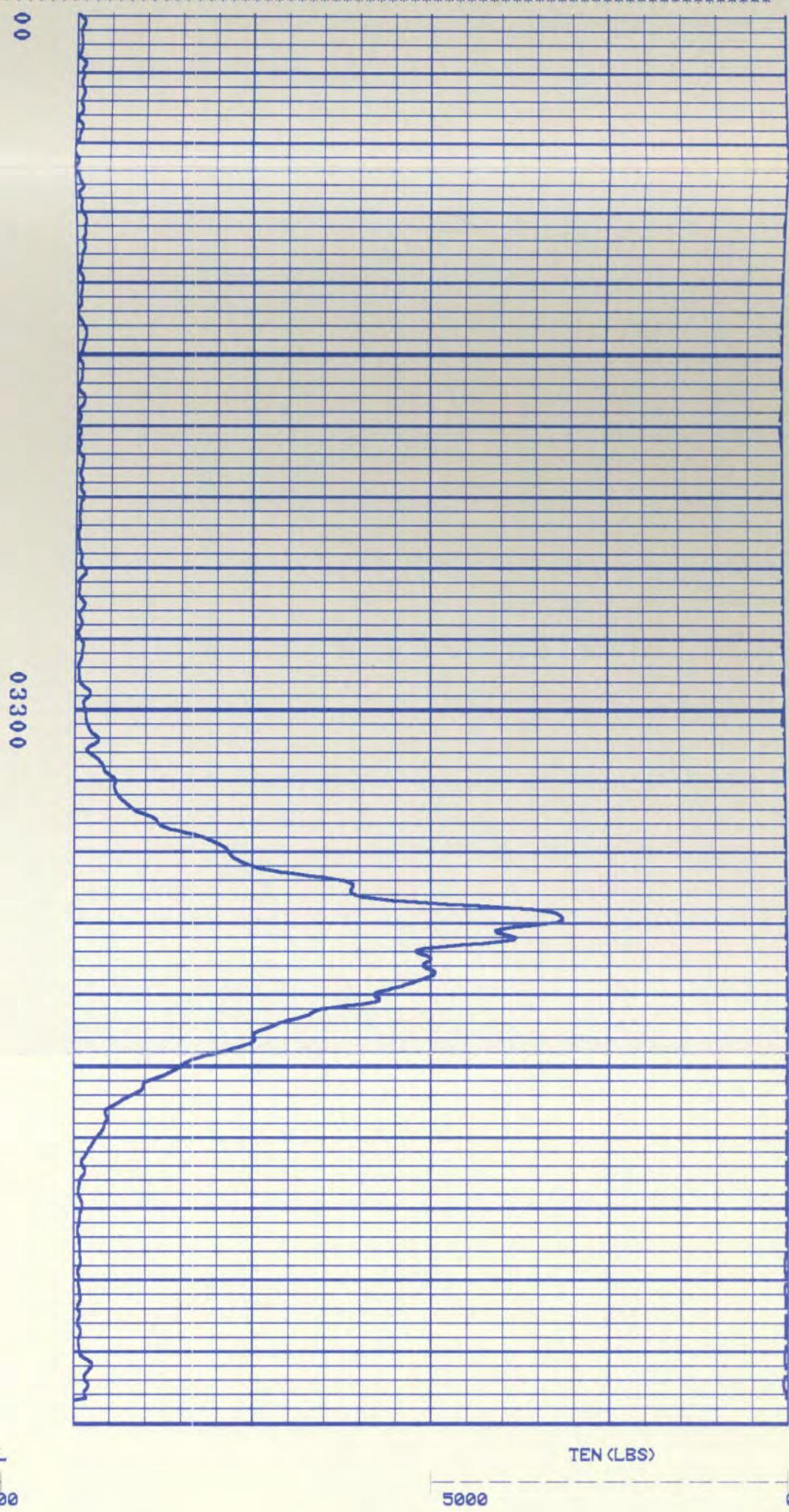
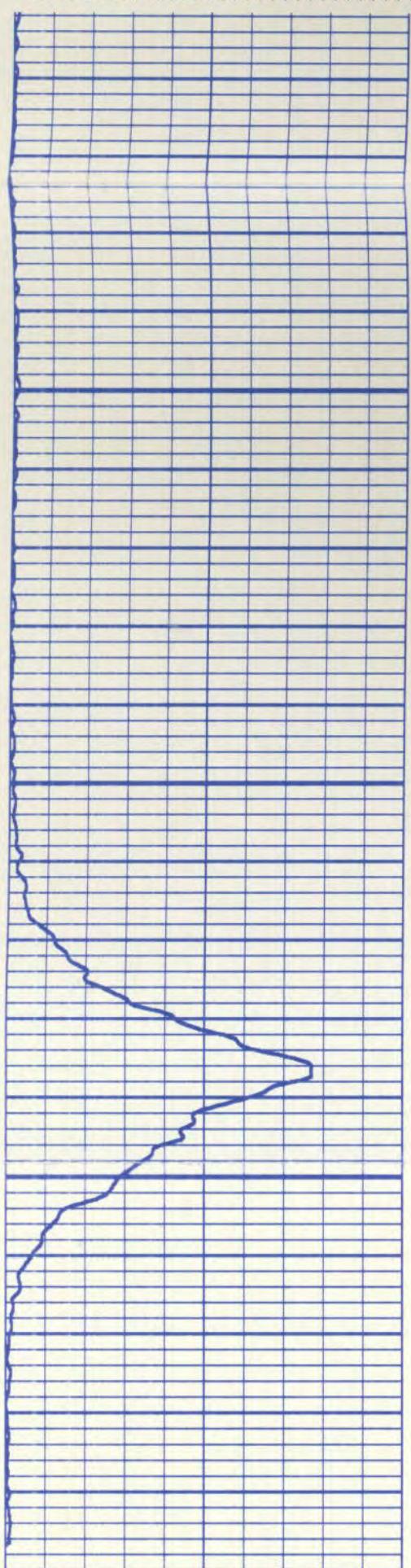
500

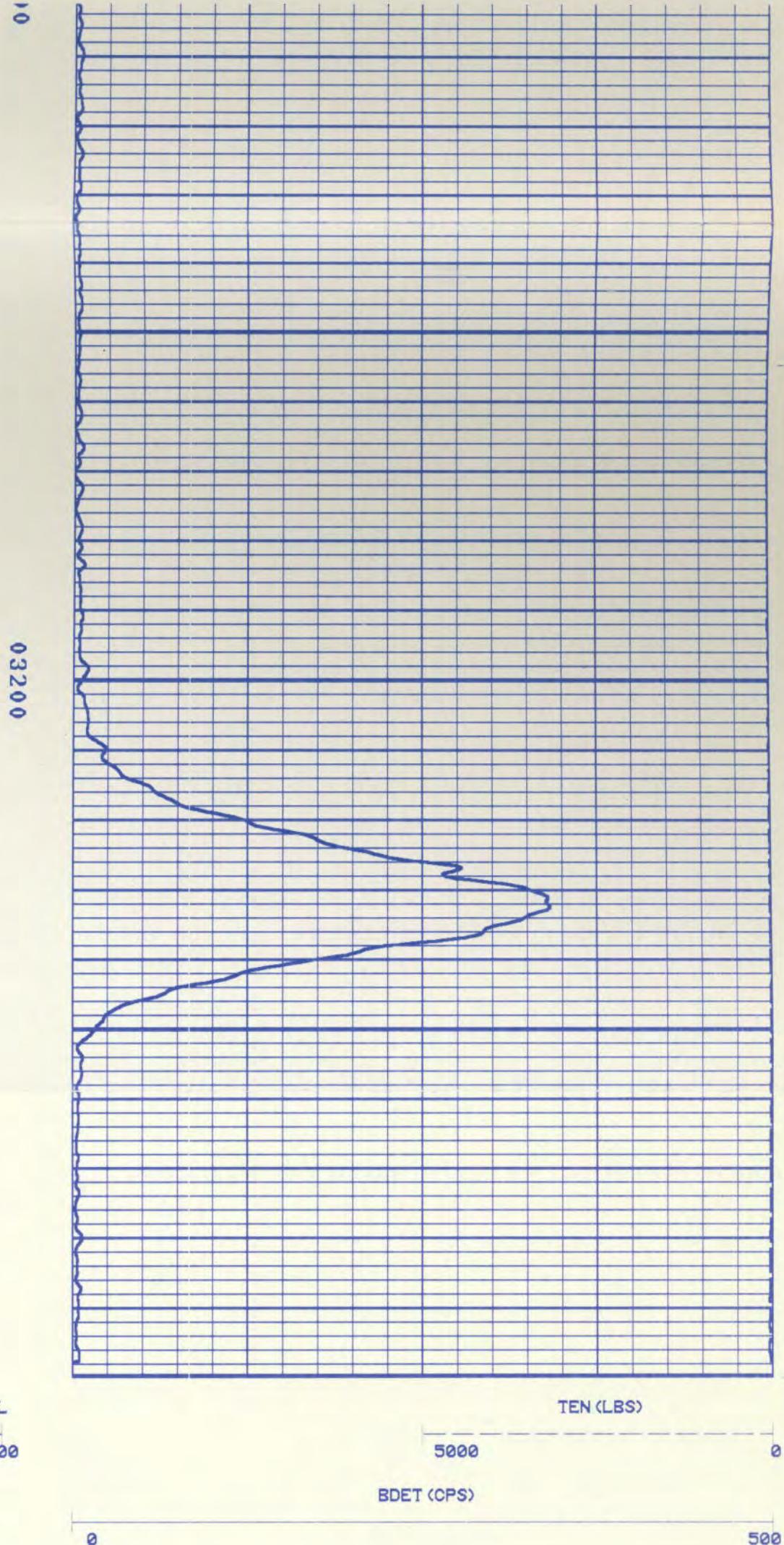
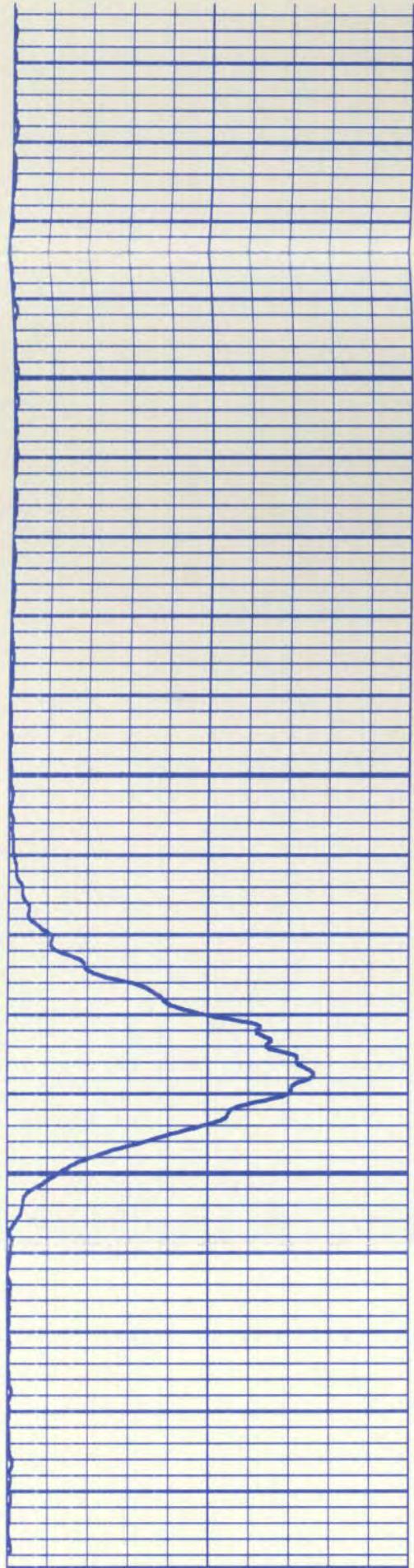
FILE: 12



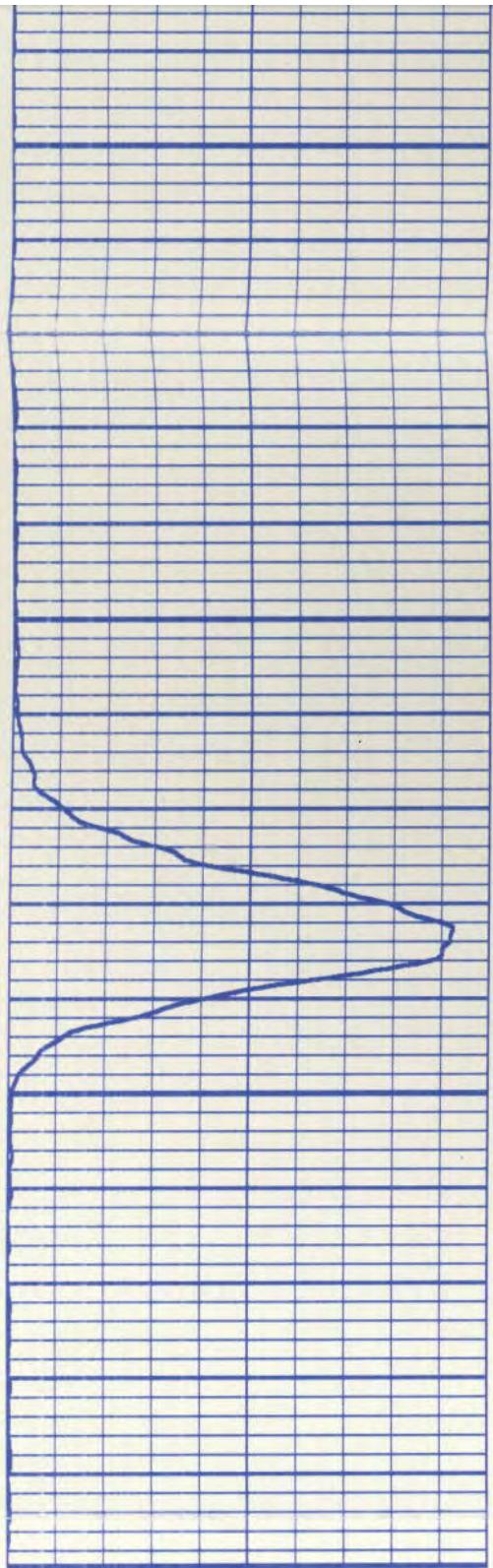
00







FILE: 10



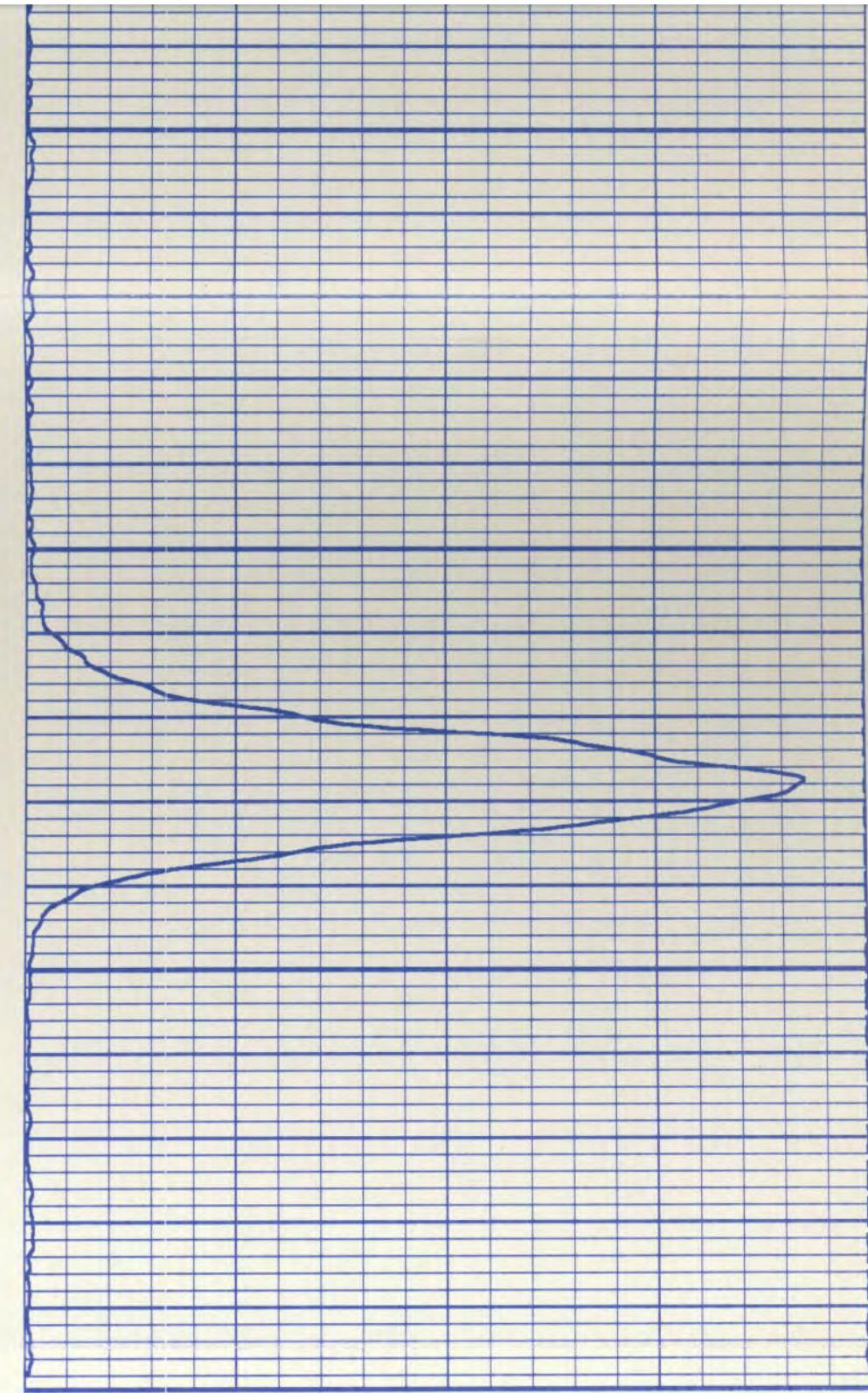
CCL

0100

TDET (CPS)

0

500



TEN (LBS)

5000

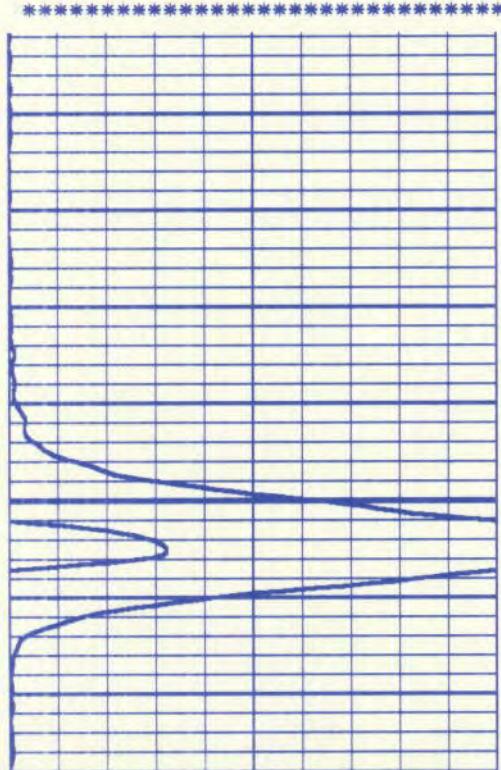
0

BDET (CPS)

0

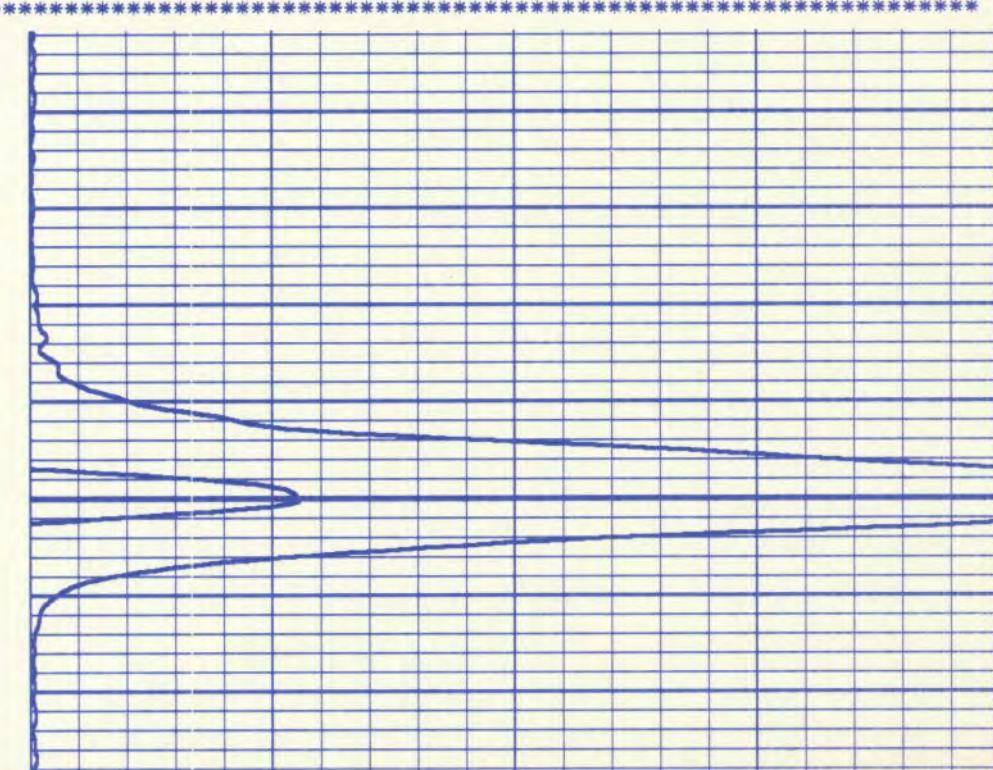
500

FILE: 9



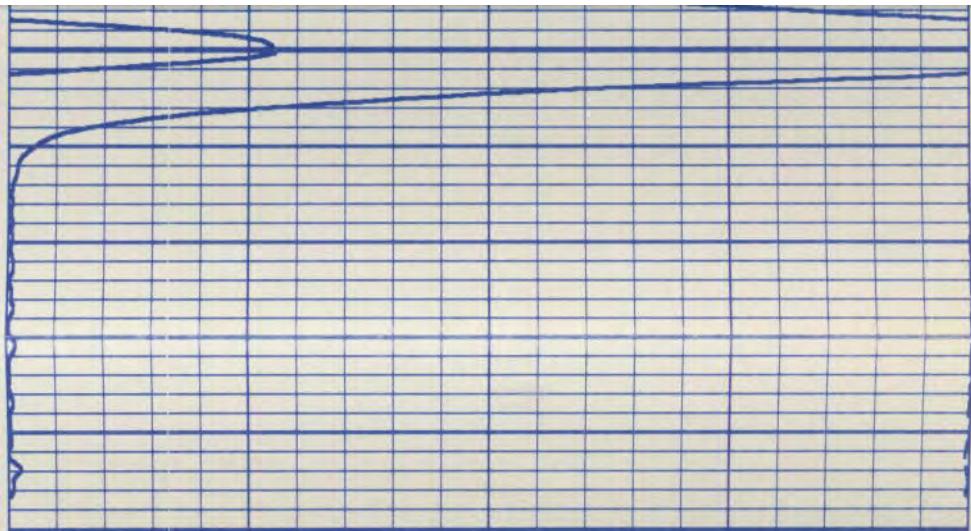
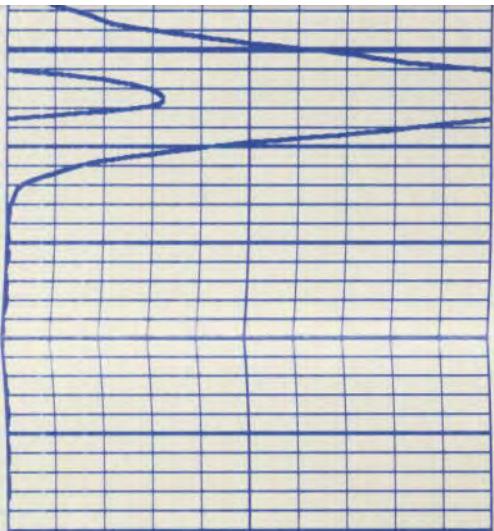
CCL

00



TEN (LBS)

500



CCL
0100

TDET (CPS)

0 500

TEN (LBS)

5000

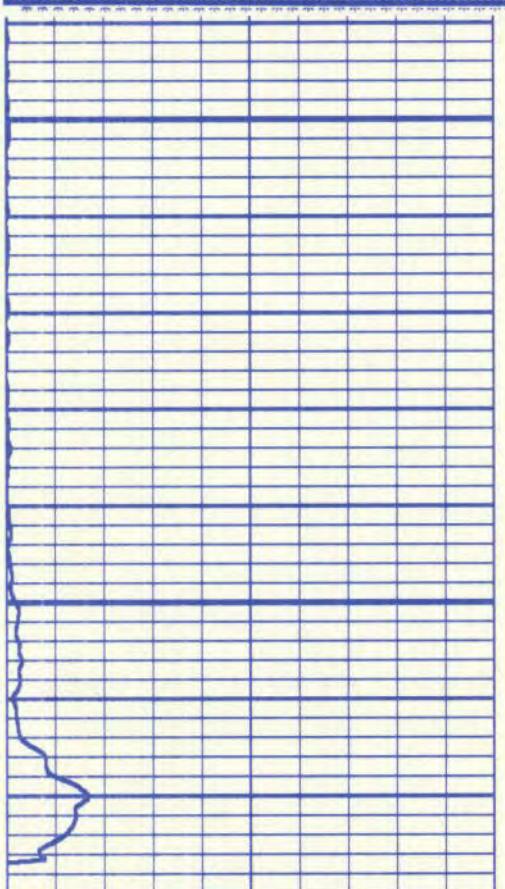
0

BDET (CPS)

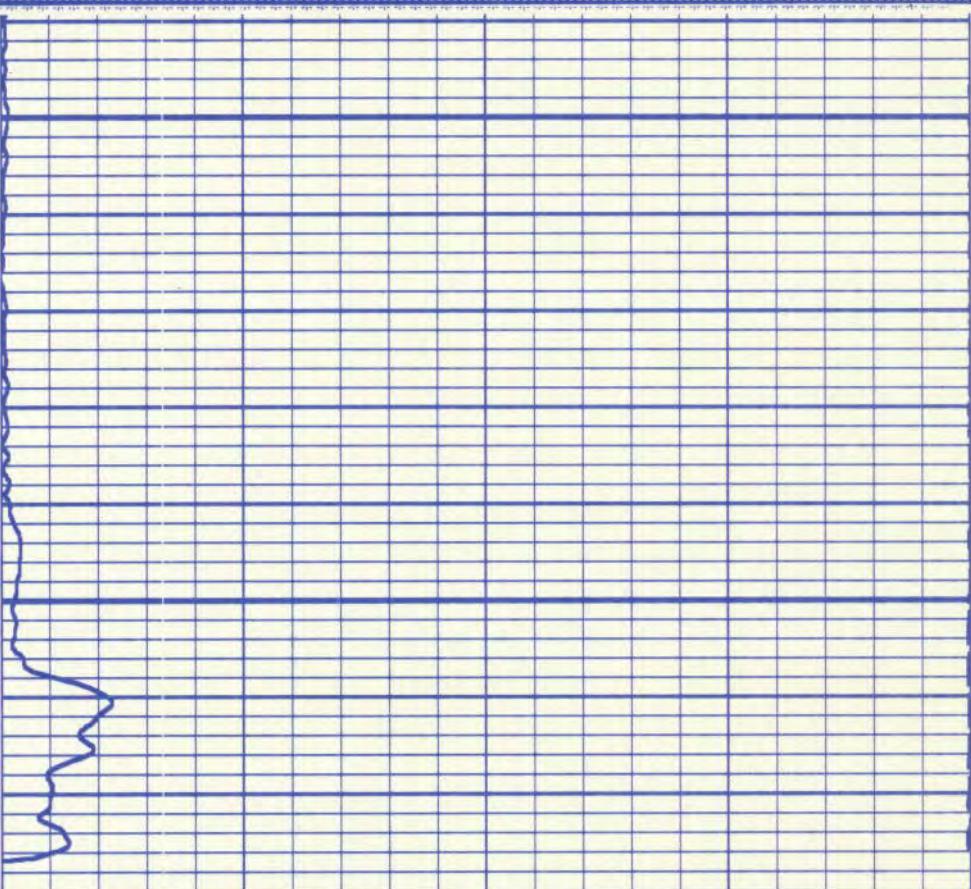
0 500

FILE: 8

SECOND SLUG SHOT AT 3000'
INJECTION RATE WAS 10 G.P.M.
SEVEN PASSES WERE MADE NO CHANNEL
WAS DETECTED.
FILES: 15-21



03400



CCL
0100

TDET (CPS)

0 500

TEN (LBS)

5000

0

BDET (CPS)

0 500

TDET (CPS)

0

CCL

0100

500

TEN (LBS)

5000

0

BDET (CPS)

0

500

FILE: 21

03400

TDET (CPS)

0

CCL

0100

500

TEN (LBS)

5000

0

BDET (CPS)

0

500

FILE: 20

03300

0340

TDET (CPS)

0

CCL

0100

500

TEN (LBS)

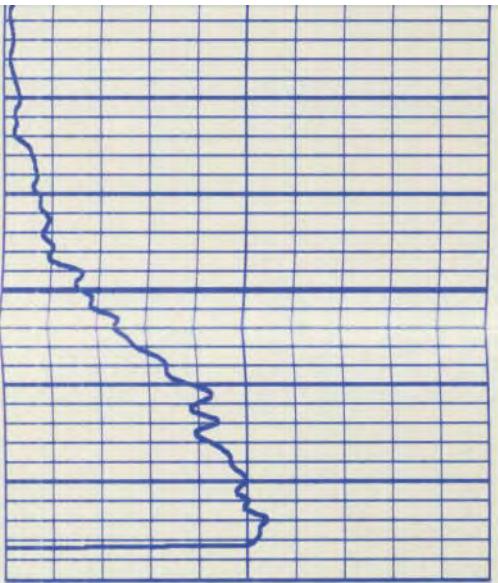
5000

0

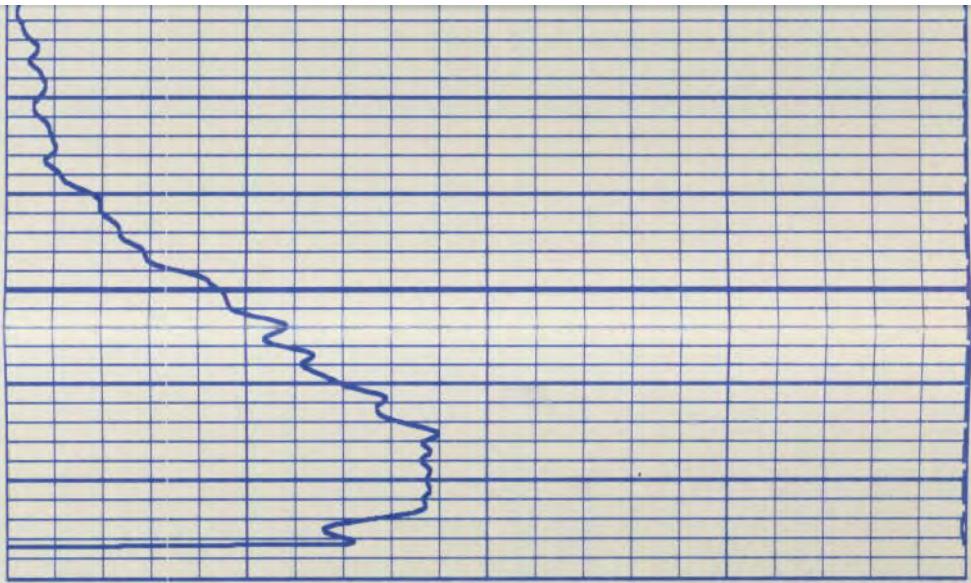
BDET (CPS)

0

500



03400



TEN (LBS)

5000

0

BDET (CPS)

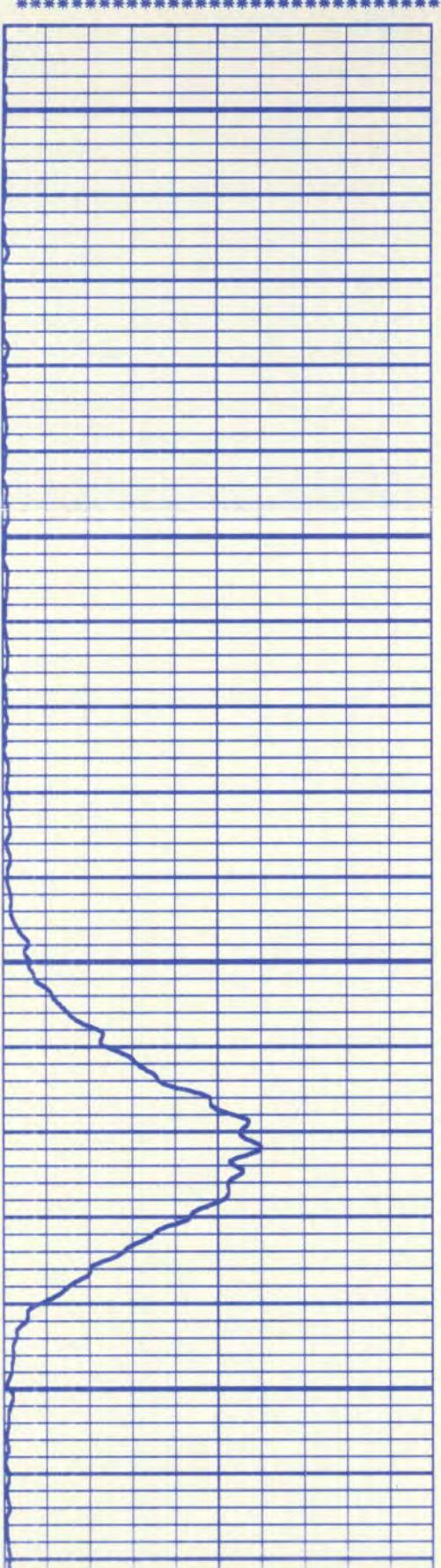
0

TDET (CPS)

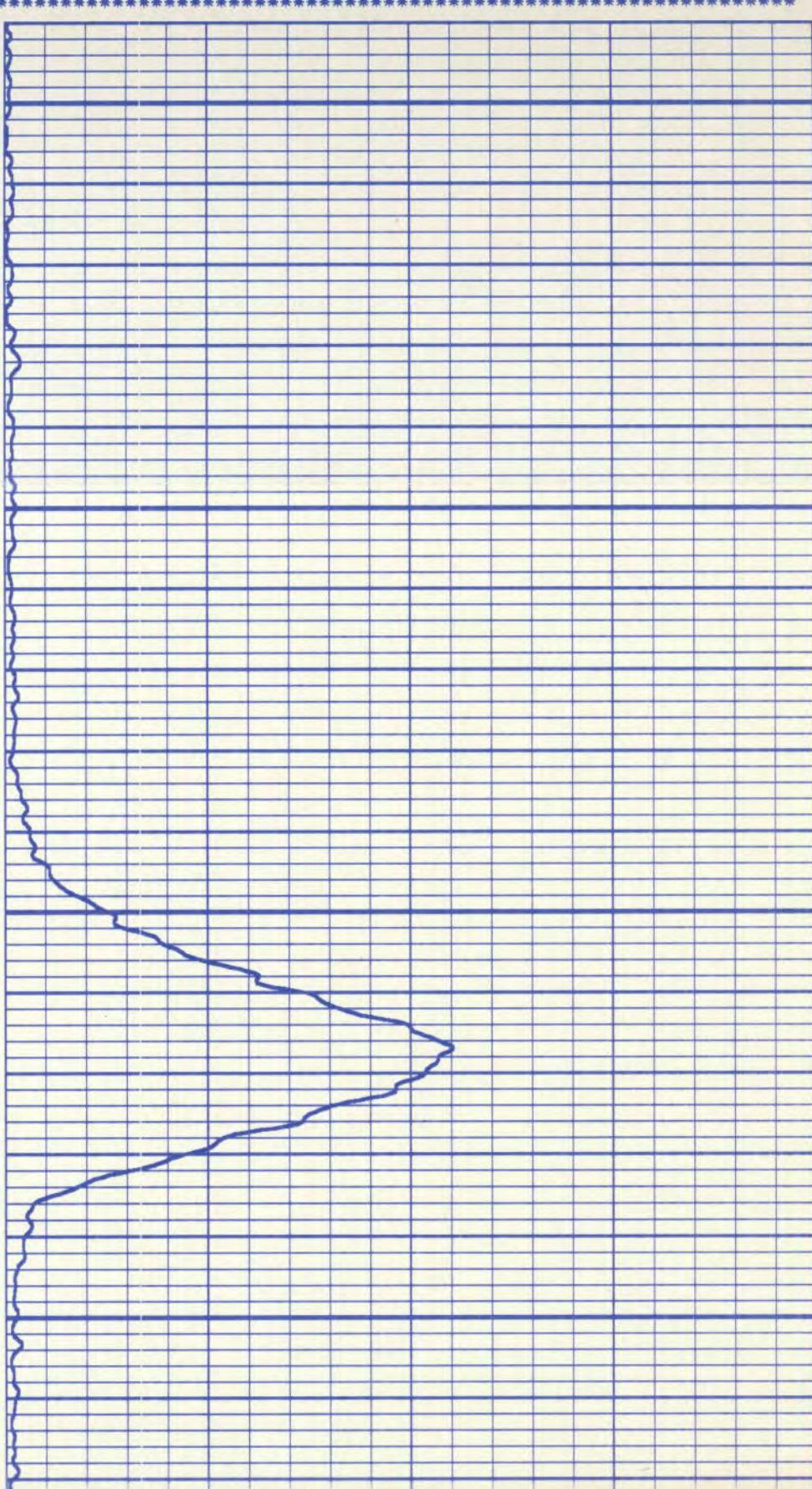
0

500

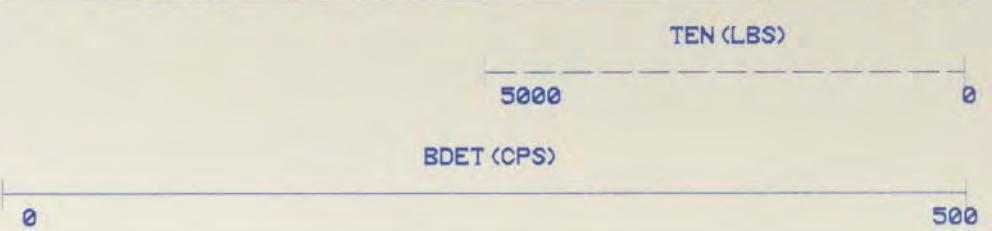
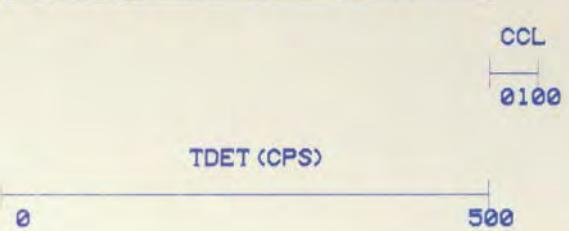
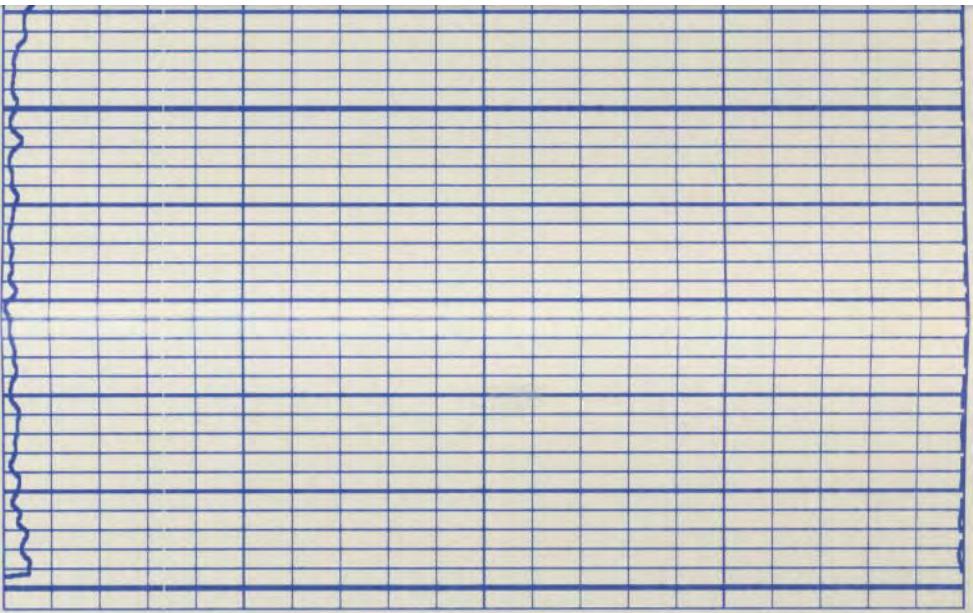
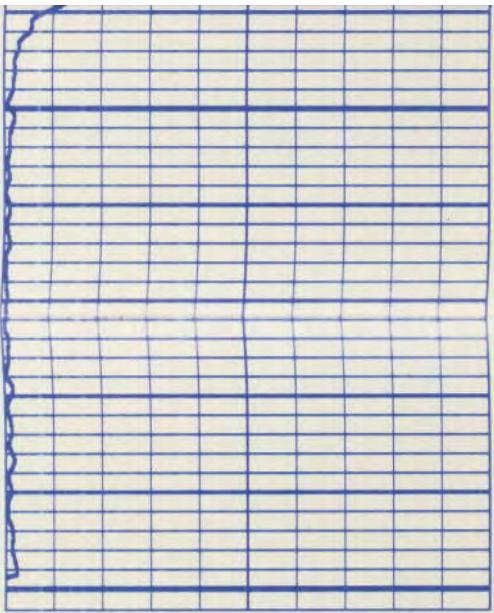
FILE: 19



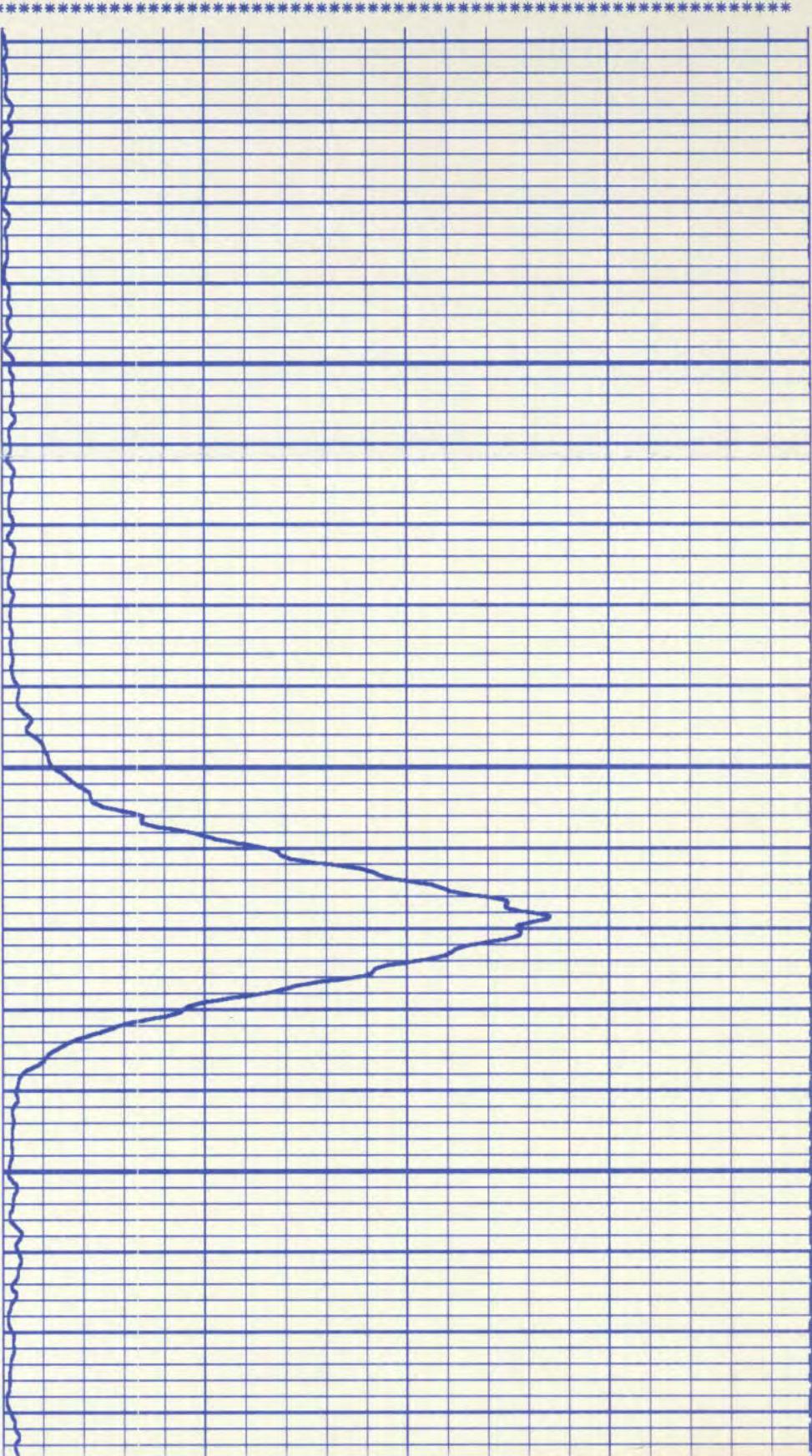
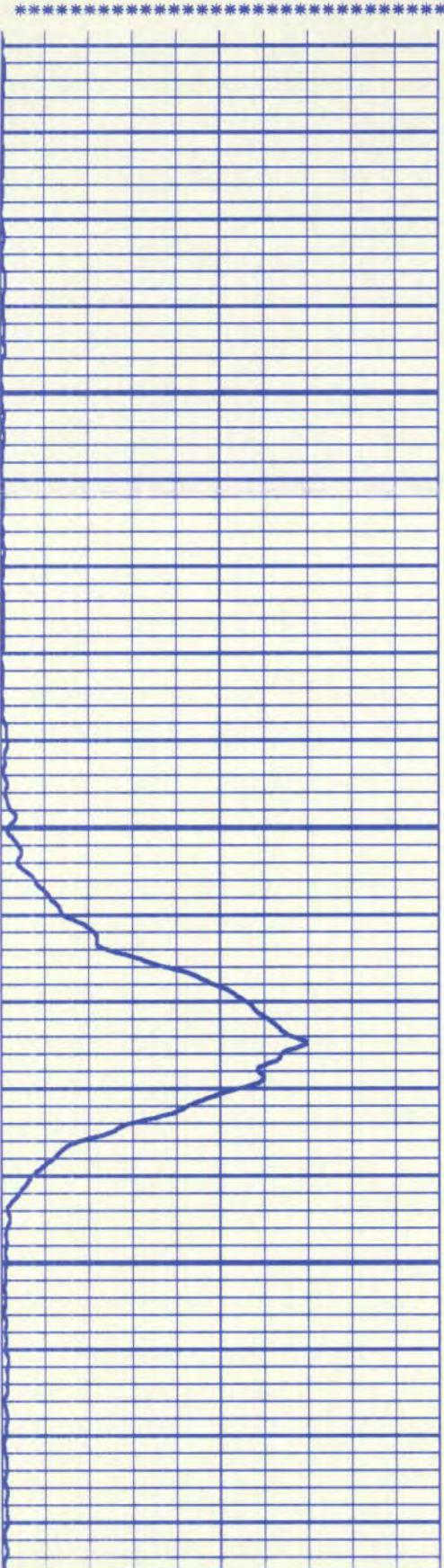
03200

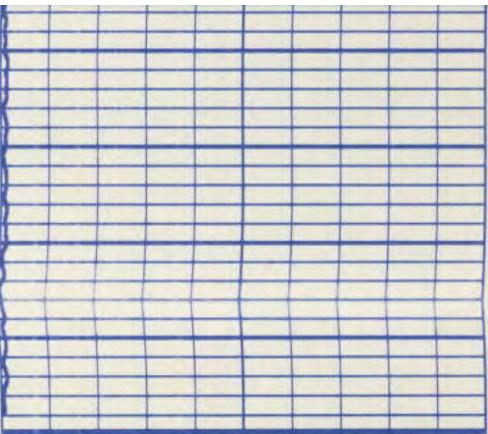


03300



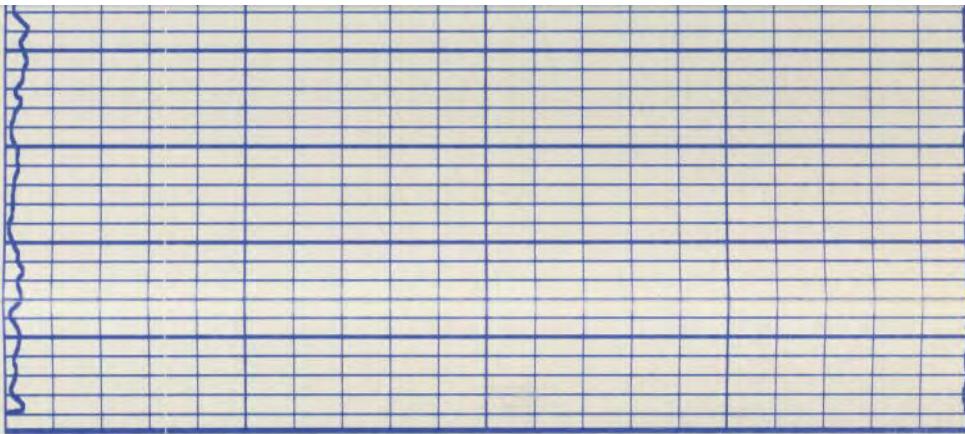
FILE: 18





CCL
0100

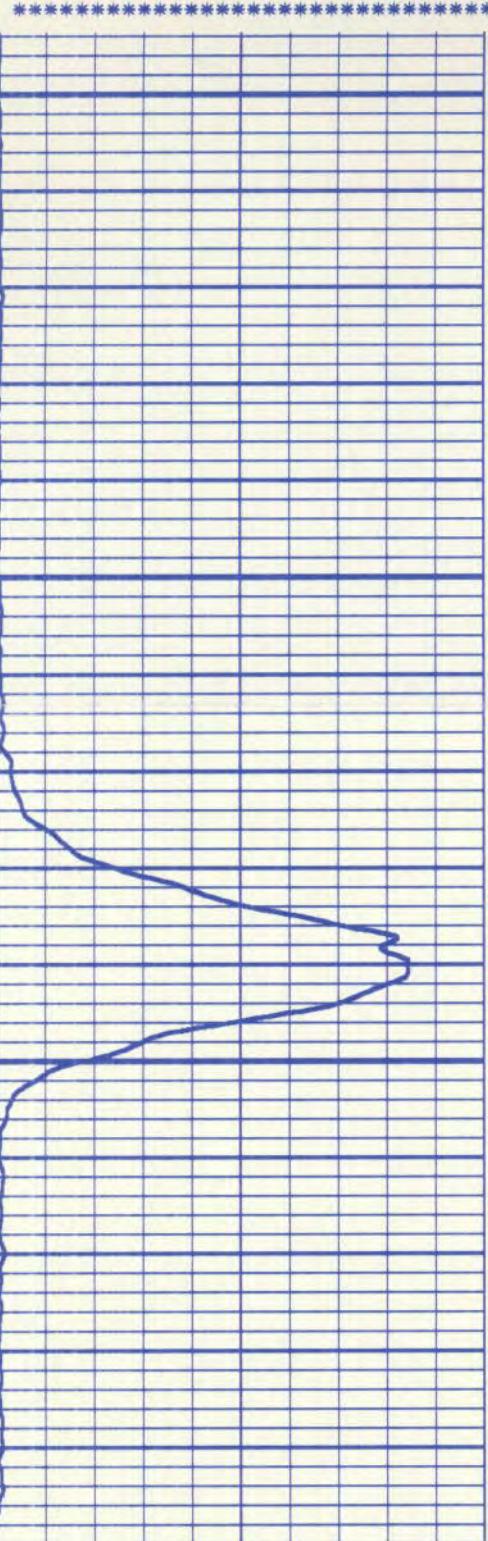
TDET (CPS)
0 500



TEN (LBS)
5000 0

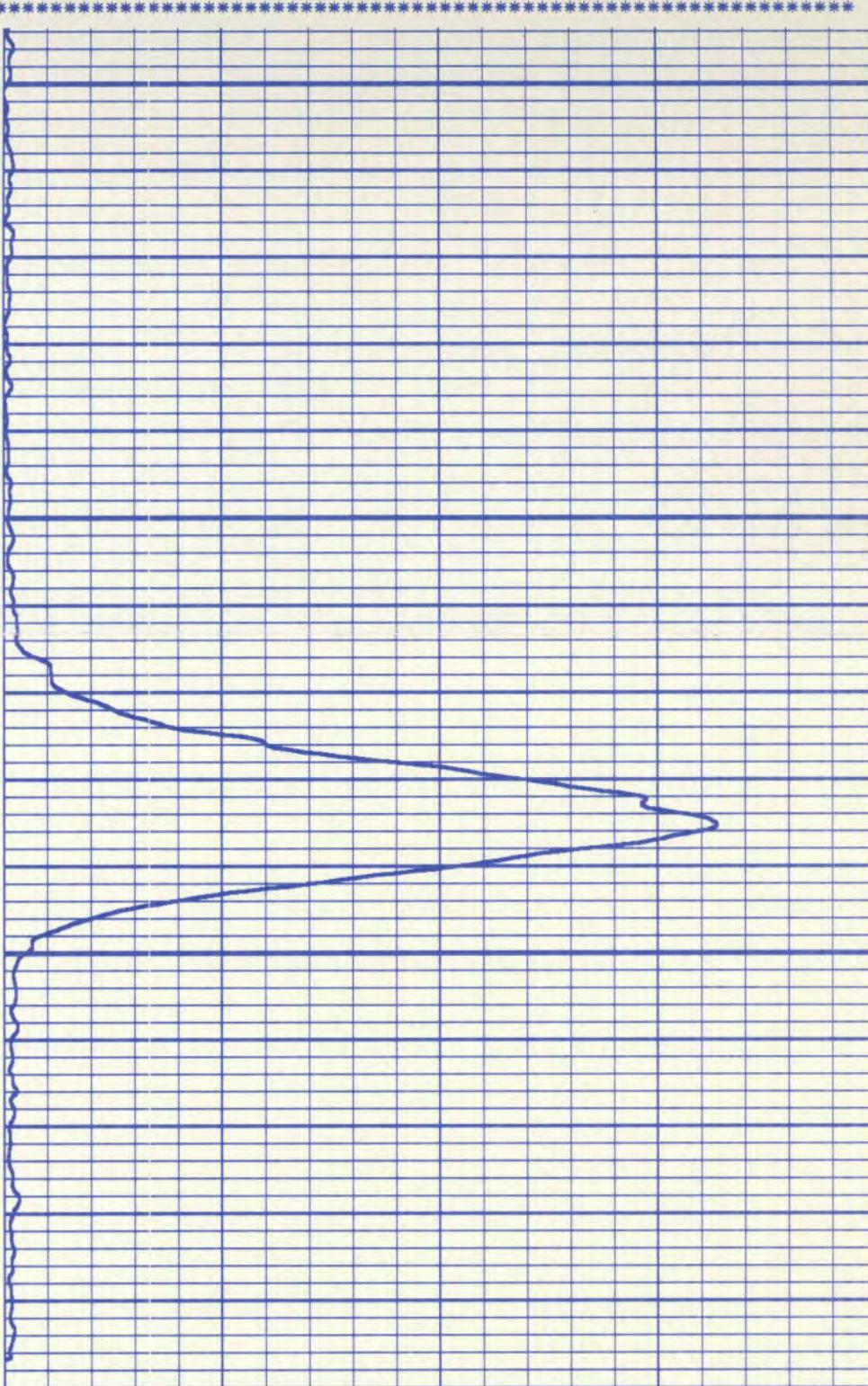
BDET (CPS)
0 500

FILE: 17



03100

CCL
0100
TDET (CPS)
0 500



TEN (LBS)
5000 0
BDET (CPS)
0 500

FILE: 16

TDET (CPS)

CCL
0100

0

500

5000

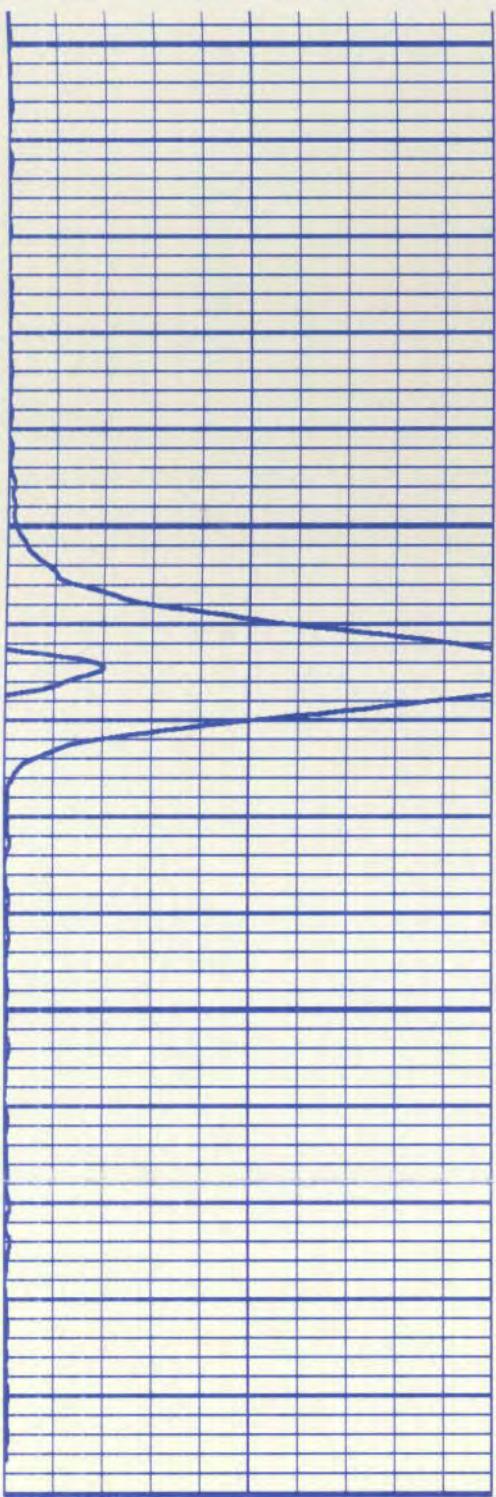
0

BDET (CPS)

0

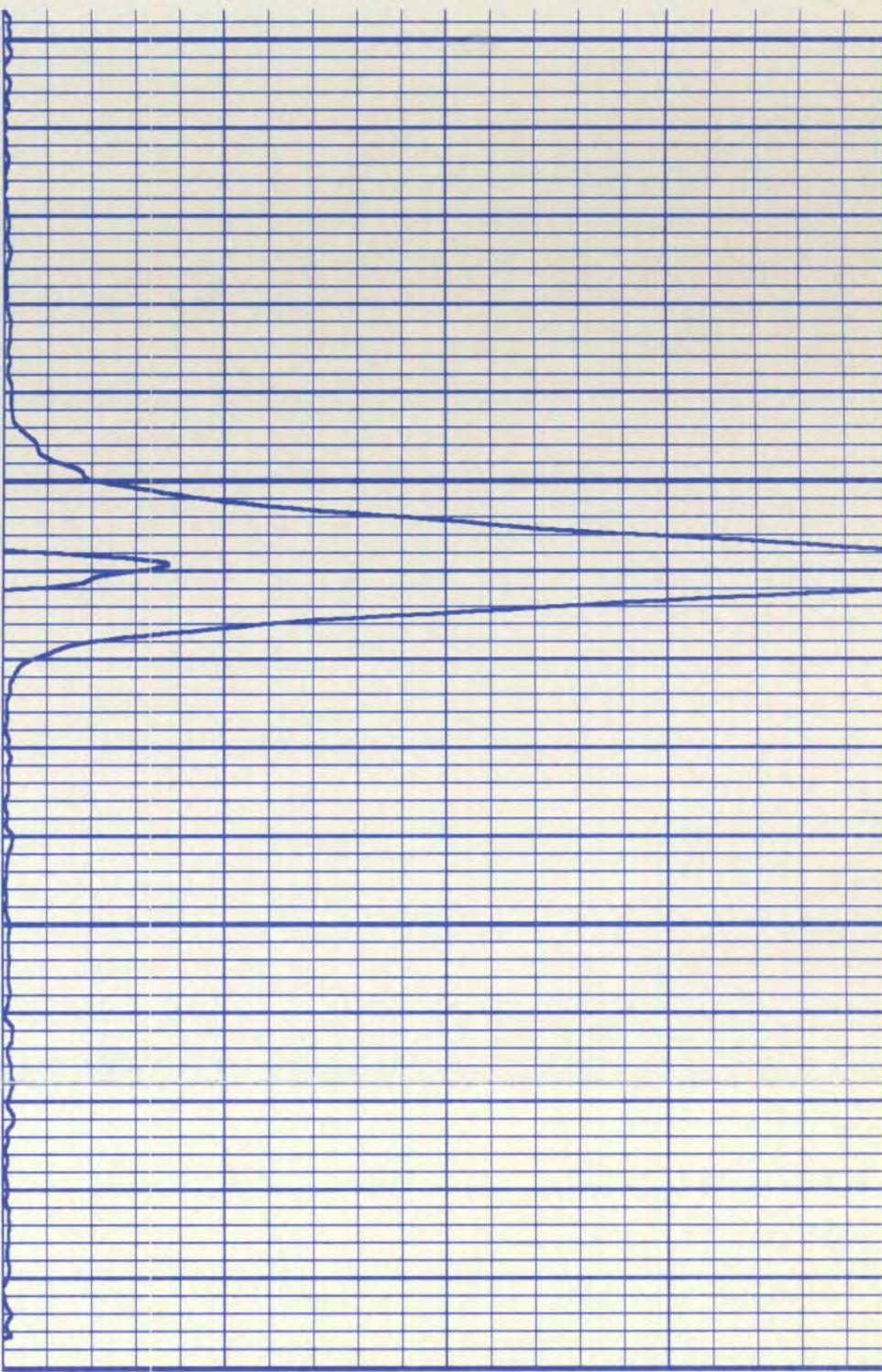
500

FILE: 16



300

03100



TEN (LBS)

5000

0

TDET (CPS)

CCL
0100

0

500

BDET (CPS)

0

500

FILE: 15

TOOL STATIONARY AT 3348
TIME DRIVE IS EQUAL TO 60' / MIN
SLUG FIRED WHILE TOOL STATIONARY

TOOL STATIONARY AT 3348
TIME DRIVE IS EQUAL TO 60' / MIN
SLUG FIRED WHILE TOOL STATIONARY
NOTE* INJECTION RATE CHANGE FROM
10 GPM TO 120 GPM DURING CHANGE EJECTOR
LEAKED R/A NOTE BOTTOM DETECTOR.

FILE: 22

COMPANY: HOECHST CELANESE CORP.

RUN: 1

WELL NAME: WELL NO.4

TRIP: 1

SERVICE: F 150A FILE: 22

DATE: 03/11/94

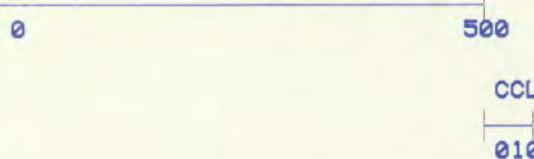
TIME: 13:51:33

REVISION: FSYS256 REV:G002 VER:2.0

MODE: RECORD

DEPTH: 3348

TDET (CPS)



BDET (CPS)

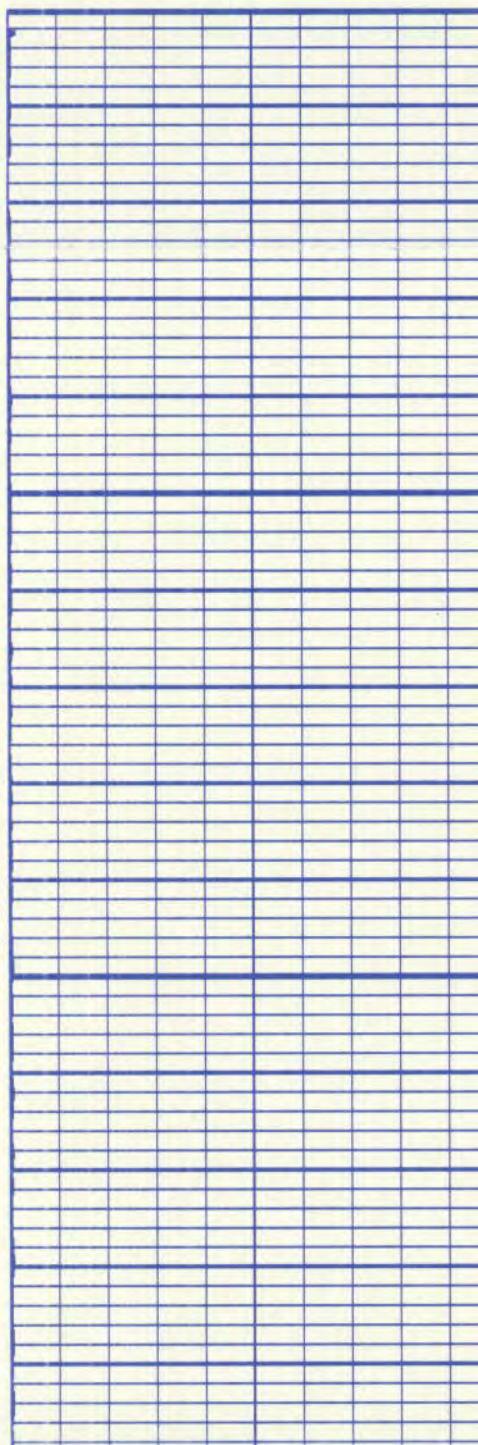


CCL
0100

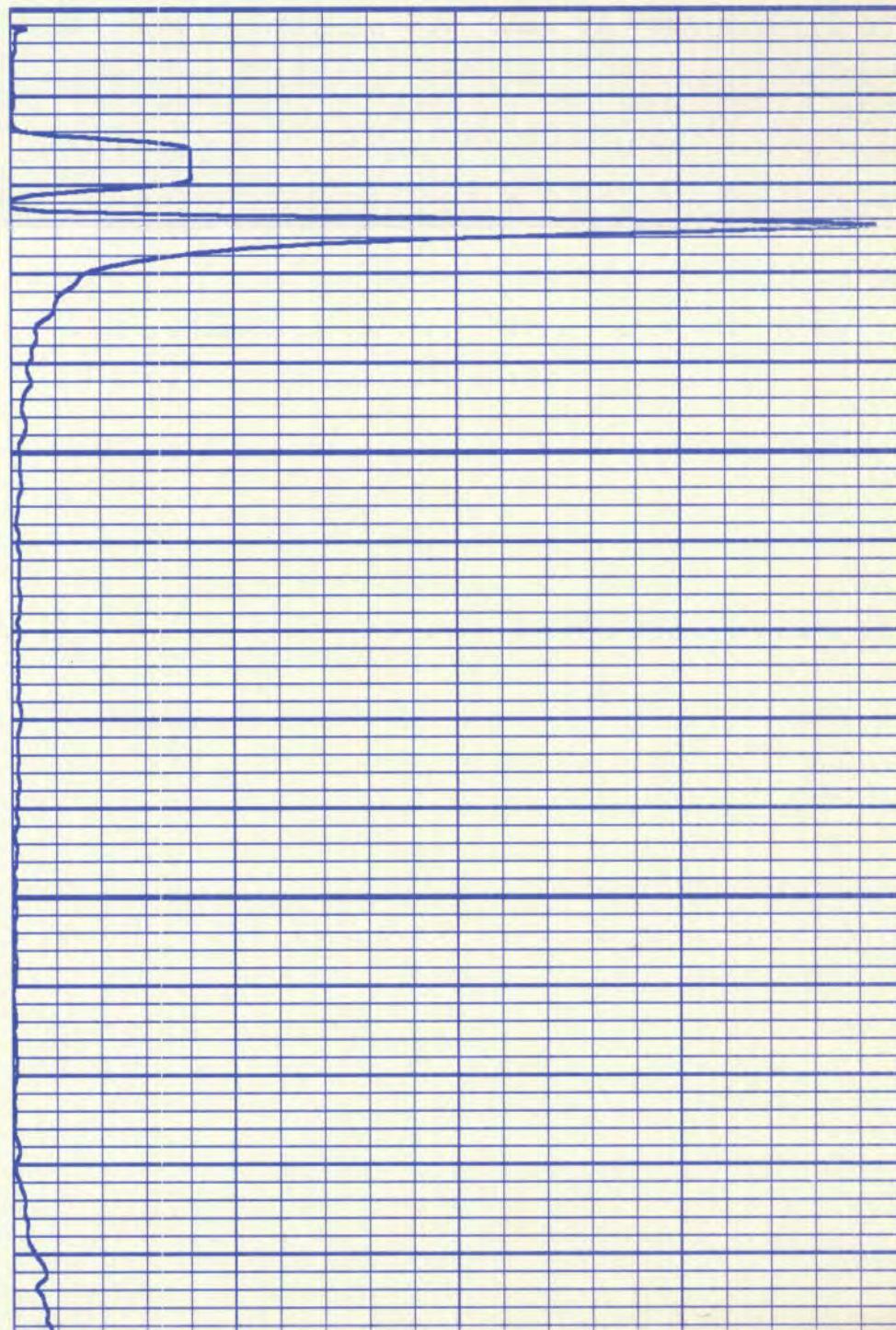
TEN (LBS)



5000



00100



00200

00300

00

00400

00500

00600

00700

00800

REPEAT SECTION
TOOL STATIONARY AT 3348
TIME DRIVE IS EQUAL TO 60' / MIN.
INJECTION RATE IS 120 G.P.M.
SLUG FIRED WHILE TOOL IS STATIONARY
NO CHANNEL DETECTED.

FILE: 23

COMPANY: HOECHST CELANESE CORP.

RUN: 1

WELL NAME: WELL NO.4

TRIP: 1

SERVICE: F 150A FILE: 23

DATE: 03/11/94

TIME: 14:07:10

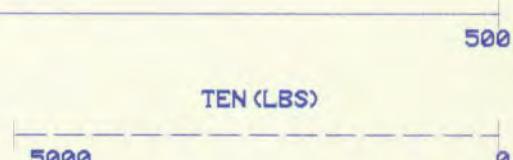
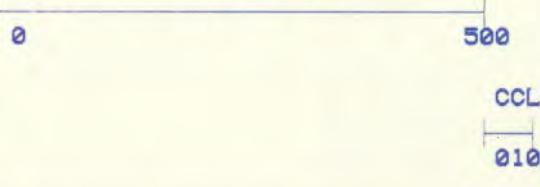
REVISION: FSYS256 REV:G002 VER:2.0

MODE: RECORD

DEPTH: 3348

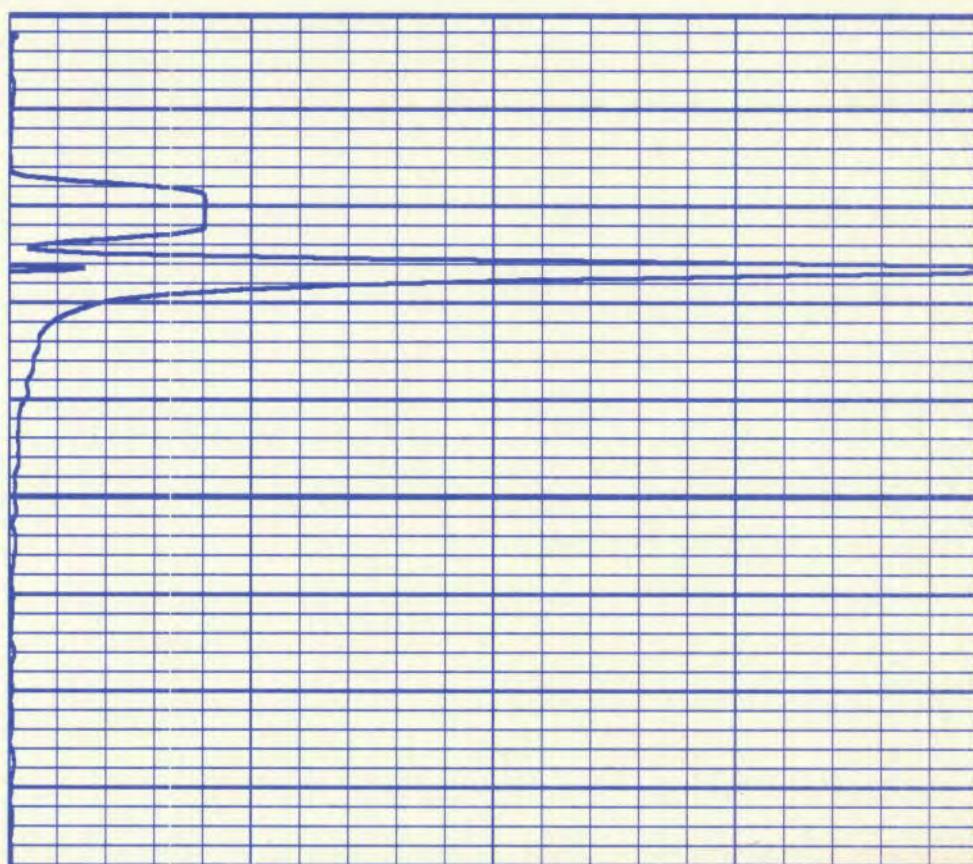
TDET (CPS)

BDET (CPS)



CCL
0100

TEN (LBS)



00100

00200

00300

00400

00500

00900

00200

00800

*****00600*****

REPEAT SECTION
TOOL STATIONARY AT 3358
TIME DRIVE IS EQUAL TO 60' / MIN.
SLUG FIRED WHILE TOOL IS STATIONARY.
NO CHANNEL DETECTED.
INJ. RATE 120 G.P.M.

FILE: 24

COMPANY: HOECHST CELANESE CORP.

RUN: 1

WELL NAME: WELL NO.4

TRIP: 1

SERVICE: F 150A FILE: 24

DATE: 03/11/94

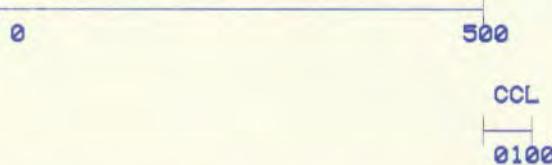
TIME: 14:23:02

REVISION: FSYS256 REV:G002 VER:2.0

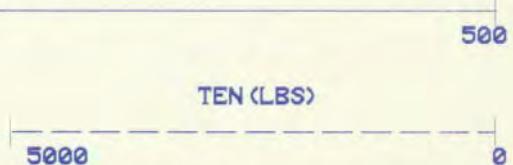
MODE: RECORD

DEPTH: 3359

TDET (CPS)



BDET (CPS)



TDET (CPS)

0

500

CCL
0100

BDET (CPS)

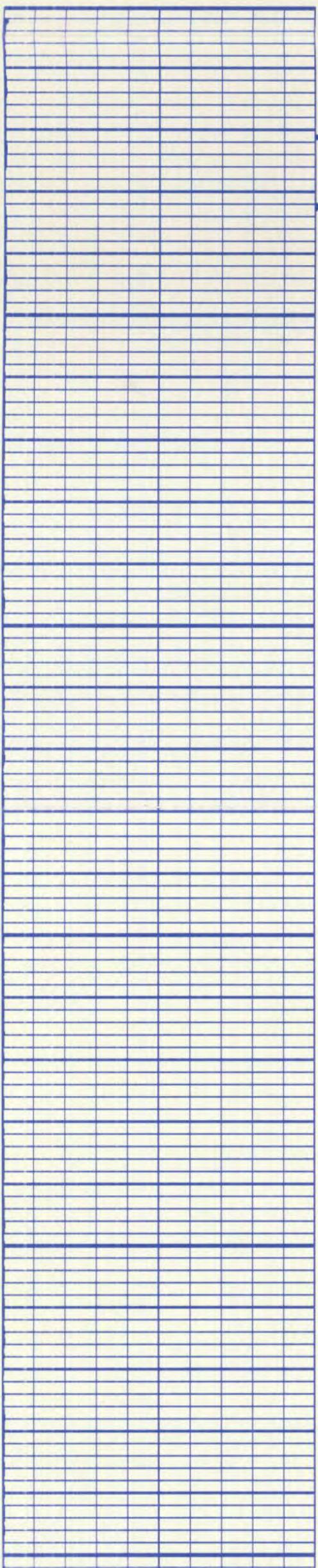
0

500

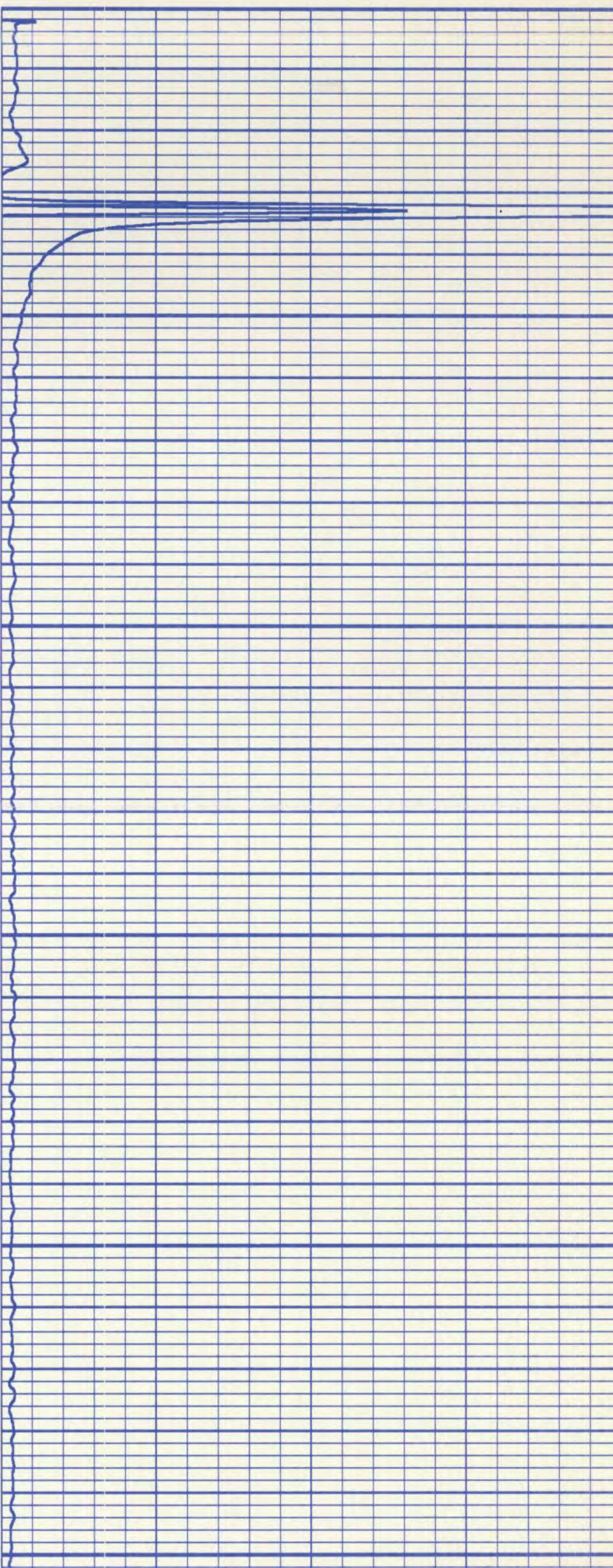
TEN (LBS)

5000

0



00100
00200



00300

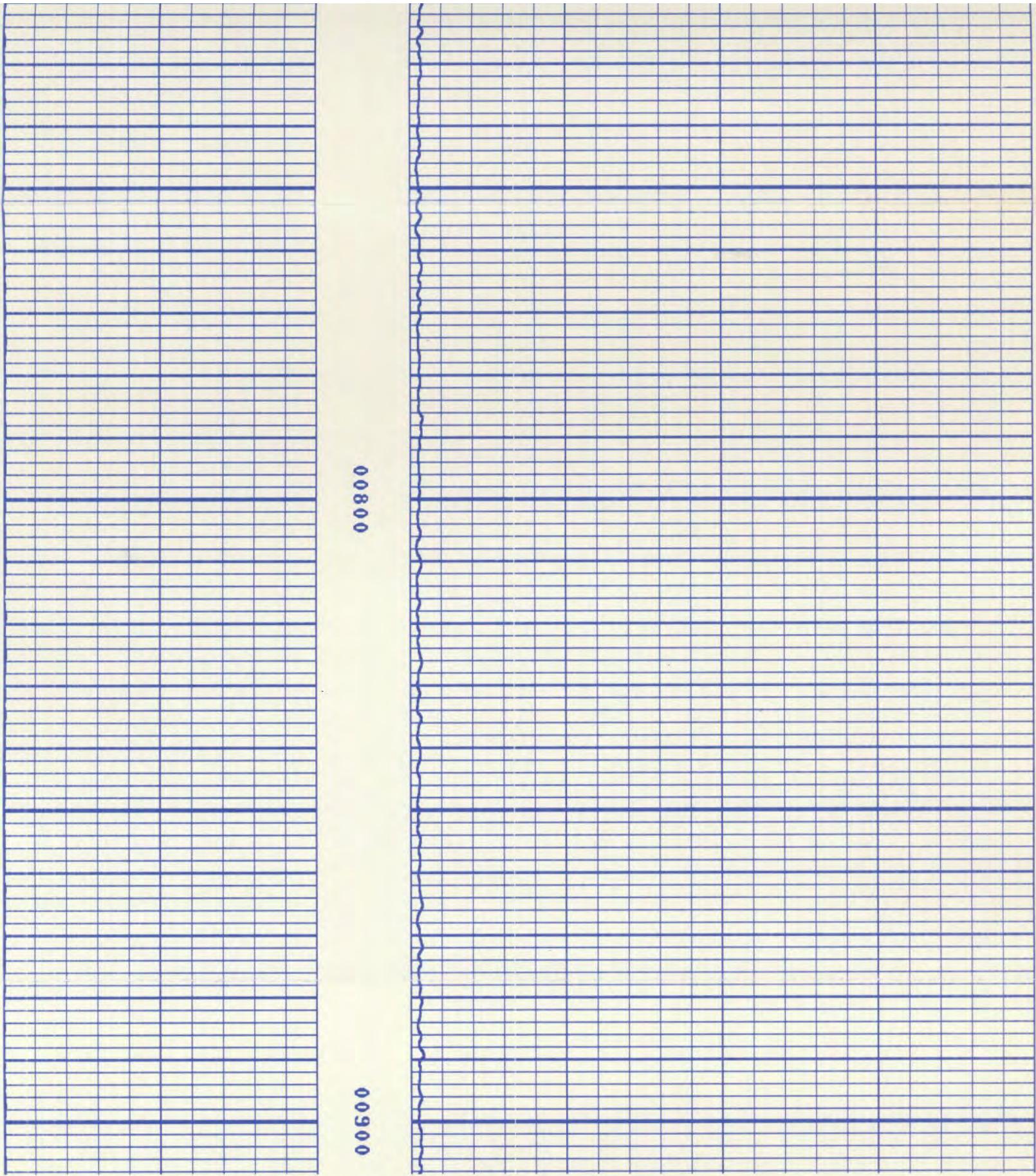
00400

00500

00500

00600

00700



AFTER INJECTION BACKGROUND GAMMA RAY PAS

FILE: 25

PARAMETERS

*** NONE ***

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORP.

RUN: 1

WELL NAME: WELL NO.4

TRIP: 1

SERVICE: F 150A FILE: 25

DATE: 03/11/94

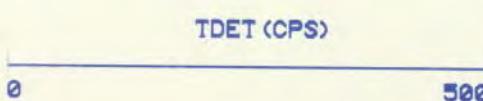
TIME: 14:41:21

REVISION: FSYS REV. J001 UER. 1.1

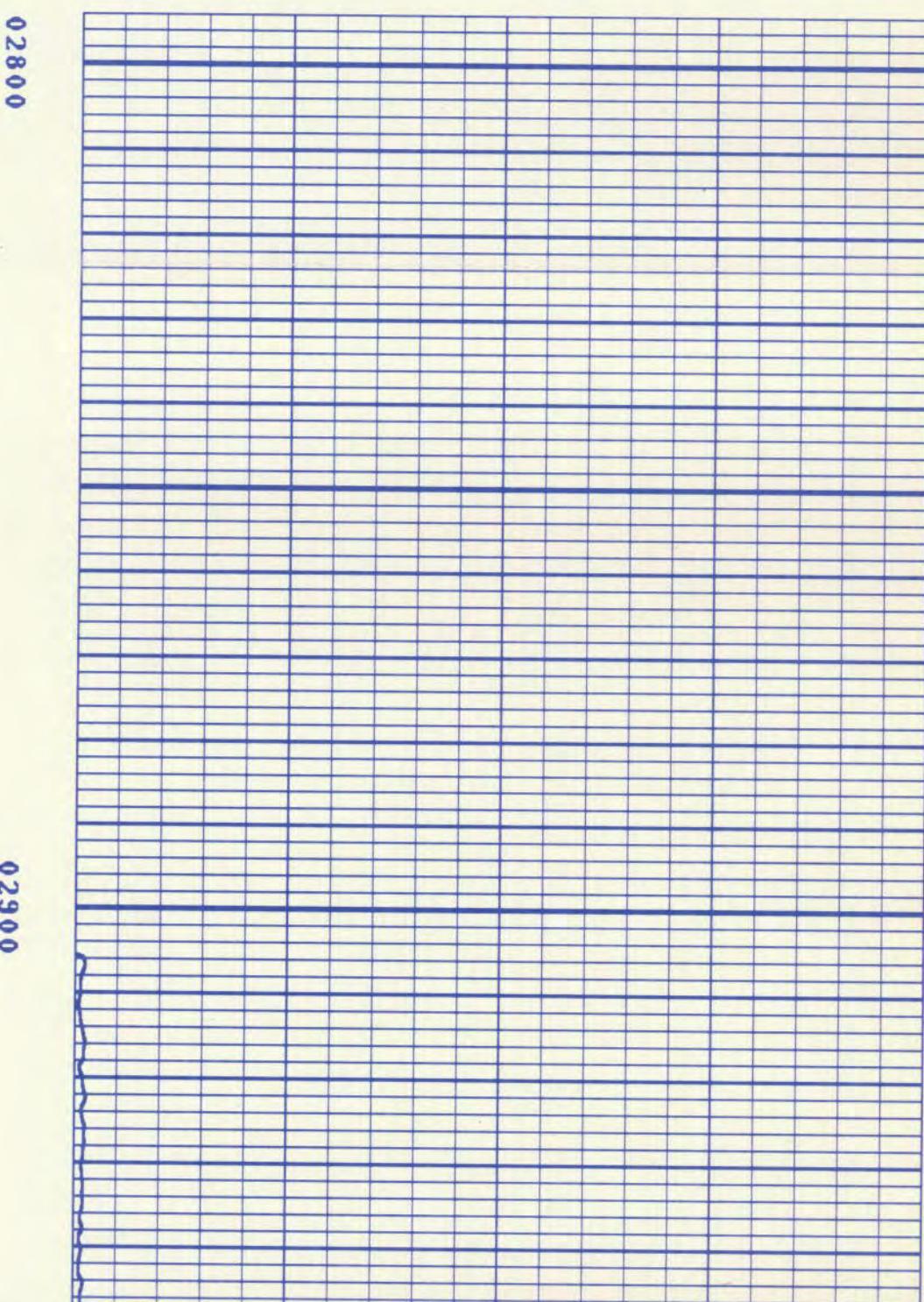
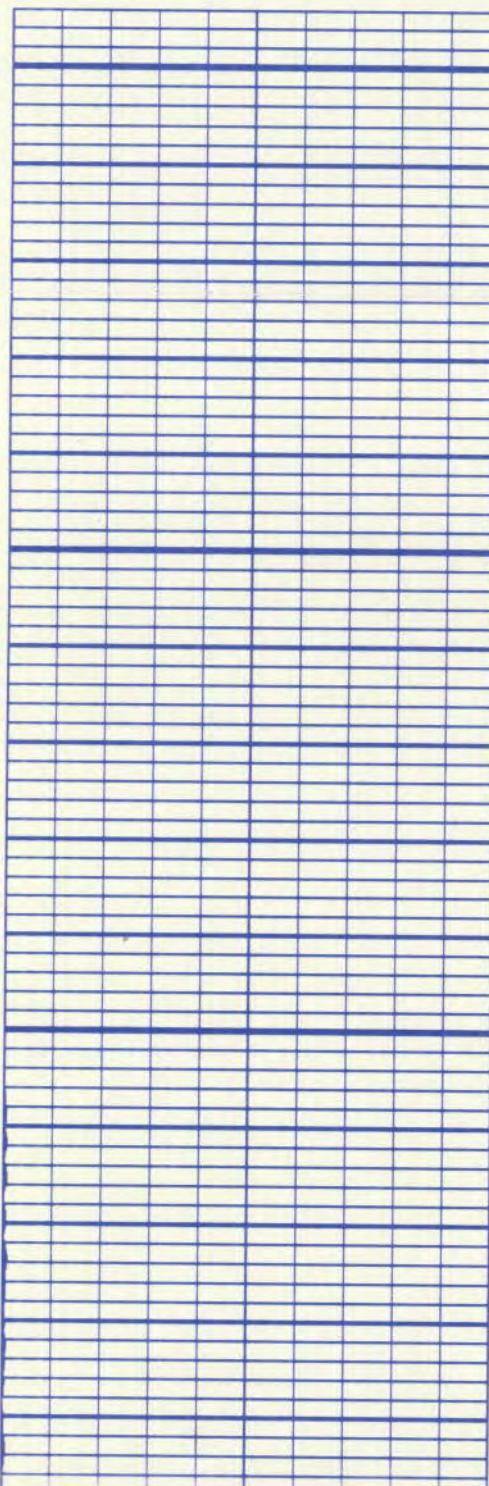
MODE: PLAYBACK

CCL

100



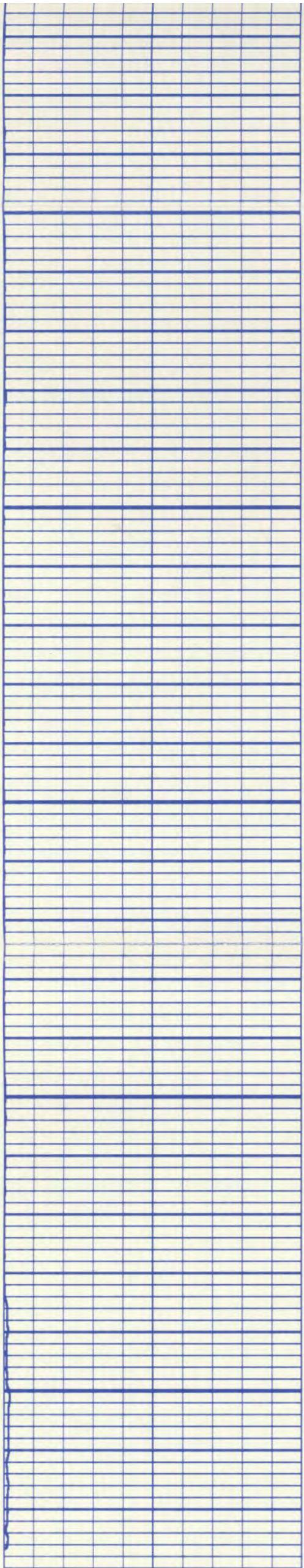
BDET (CPS)



03000

03100

03



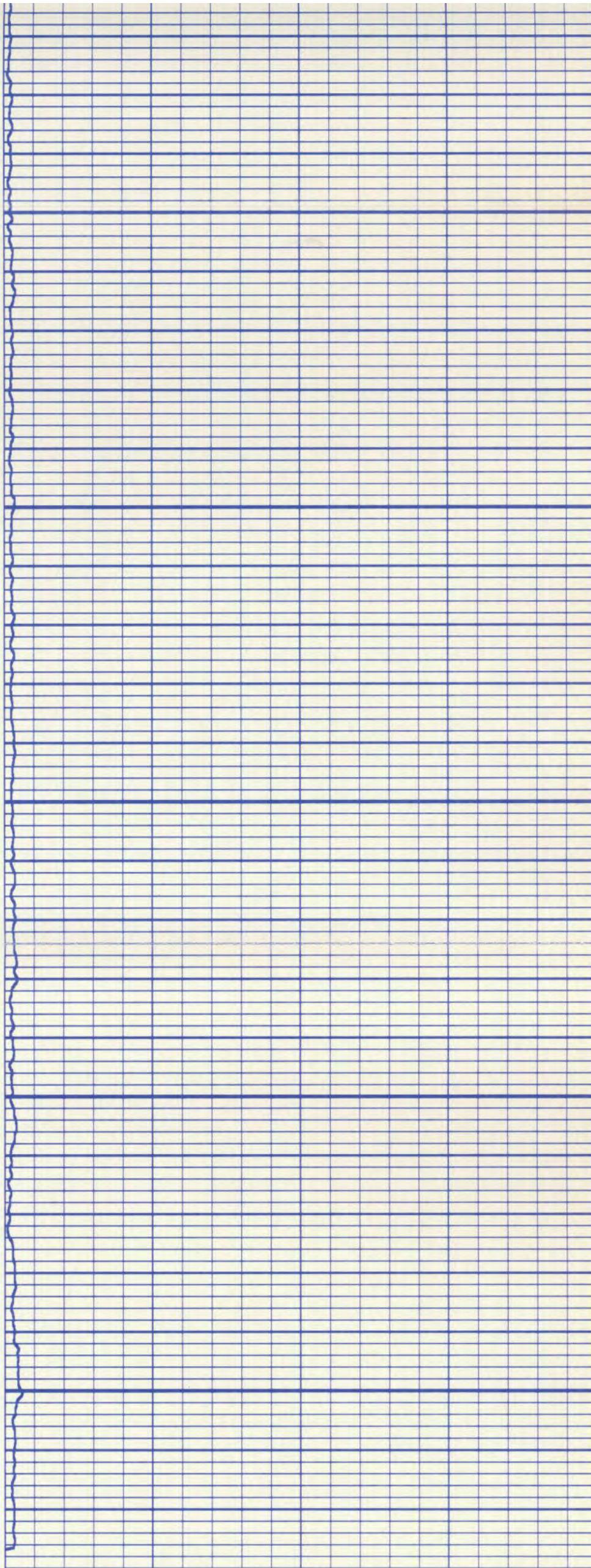
03200

03300

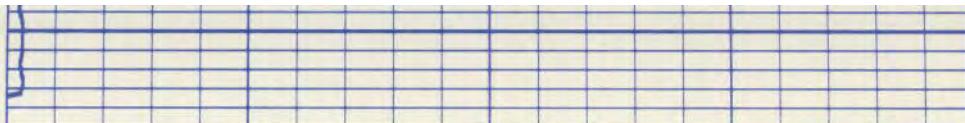
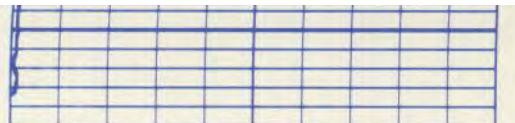
03400

CCL
100

TDET (CPS)



BDET (CPS)



CCL

100

TDET (CPS)

0

500

BDET (CPS)

0

500

FILE: 25



FILE: 2

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORP.

RUN: 1

WELL NAME: WDW WELL NO.4

TRIP: 1

SERVICE: F 159P FILE: 2

DATE: 03/11/94

TIME: 11:25:53

REVISION: FSYS REV. J001 VER. 1.1

MODE: PLAYBACK

CCL

100

GR (API)

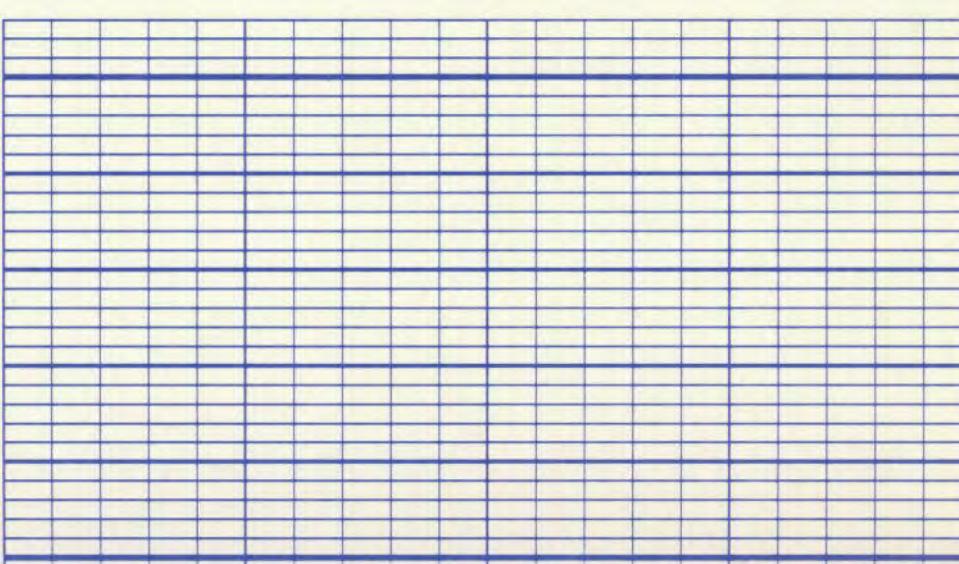
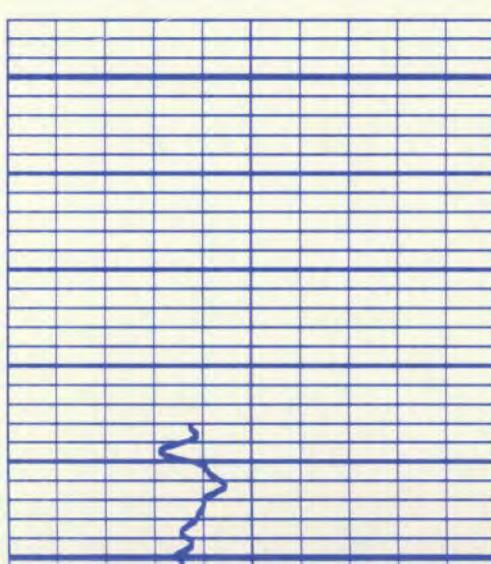
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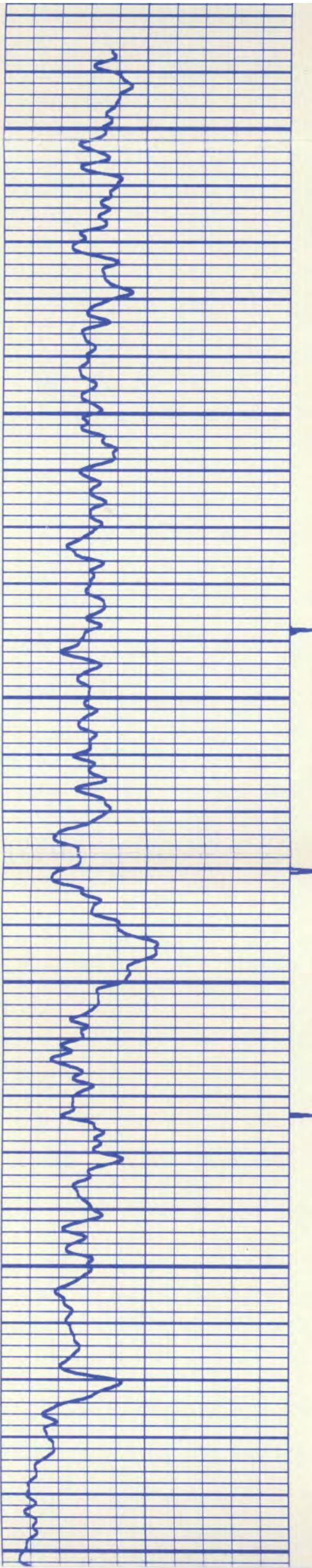
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TEN (LBS)

1000

0





03200

03300

03400